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(12) **United States Patent**
Grim et al.

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(54) **ADJUSTABLE WALKING APPARATUS**

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(73) Assignee: **Ovation Medical**, Agoura Hills, CA (US)

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This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**
A61F 5/01 (2006.01)
A43B 7/20 (2006.01)

(52) **U.S. Cl.**
CPC ***A61F 5/0111*** (2013.01); ***A43B 7/20*** (2013.01)

(58) **Field of Classification Search**
CPC A61F 5/0111; A61F 5/01; A61F 5/0193; A61F 5/0102; A61F 5/0116; A61F 5/012;
(Continued)

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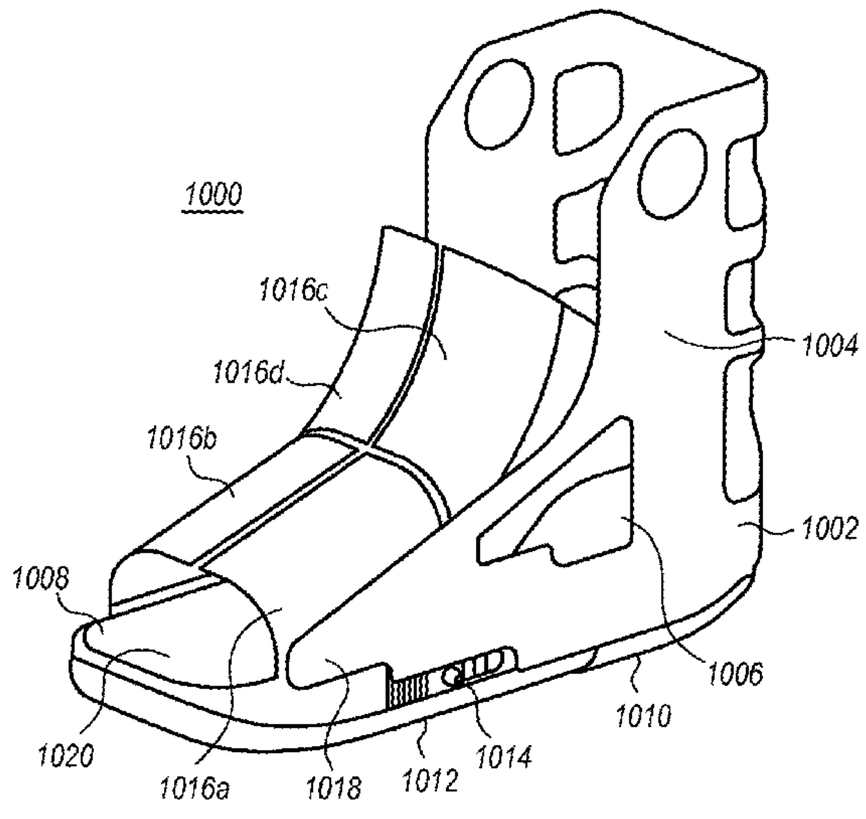
(57) **ABSTRACT**

A walking apparatus is provided that includes a sole having an adjustable length, the sole comprising a heel portion, a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position relative to the heel portion, wherein a length of the sole is configured to adjust from a first length to a second length when the forefoot portion is adjusted from the first position to the at least one other position.

18 Claims, 36 Drawing Sheets



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(58) **Field of Classification Search**
CPC A61F 5/0123; A61F 5/019; A61F 5/0127; A61F 13/066; A61F 5/0104; A61F 5/0125; A61F 5/0113; A61F 2250/001; A61F 5/0585; A61F 2005/0158; A61F 2005/0167; A61F 5/14; A61F 13/043; A61F 13/064; A43B 7/20; A43B 3/26
See application file for complete search history.

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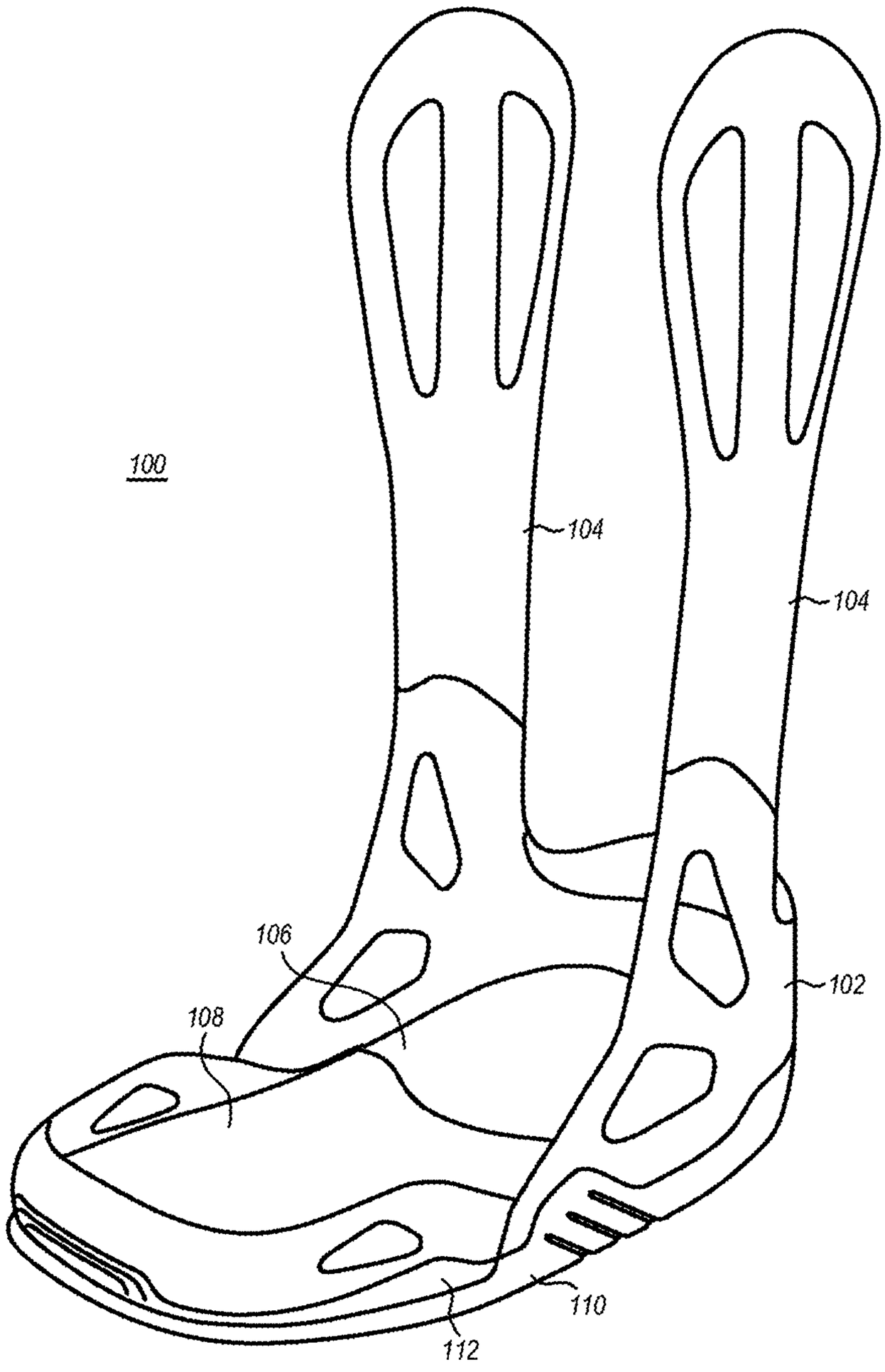


FIG. 1A

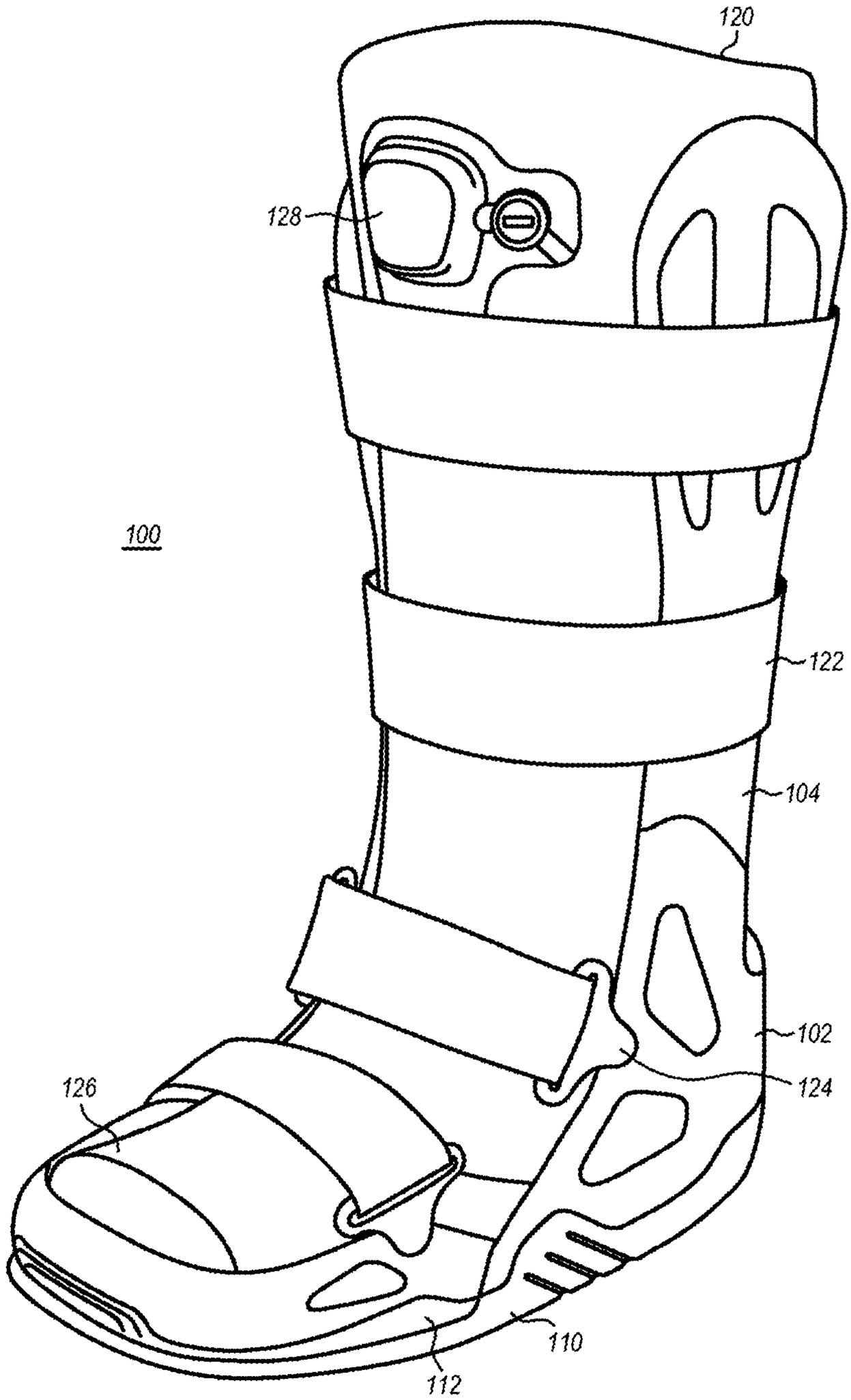


FIG. 1B

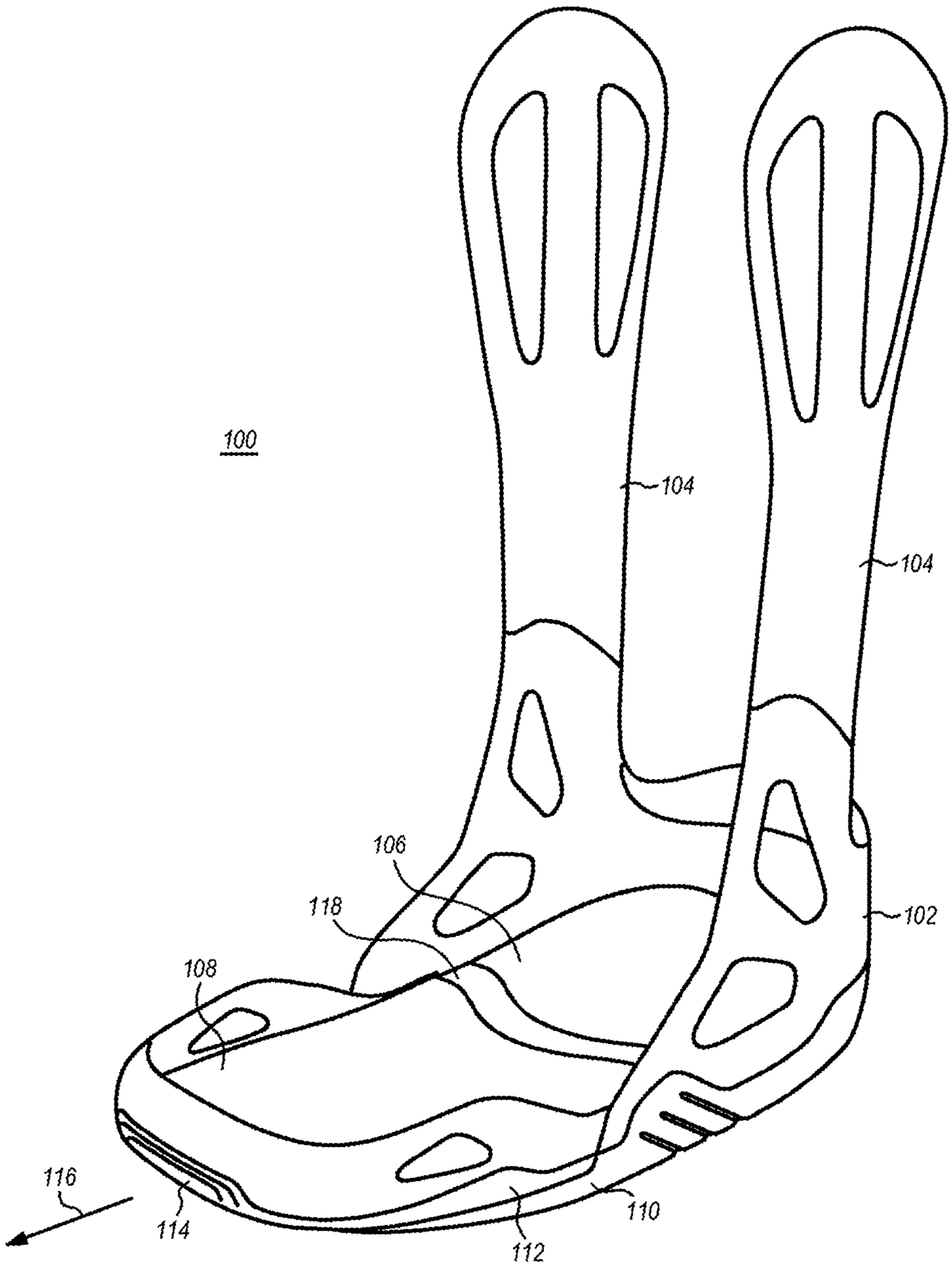


FIG. 1C

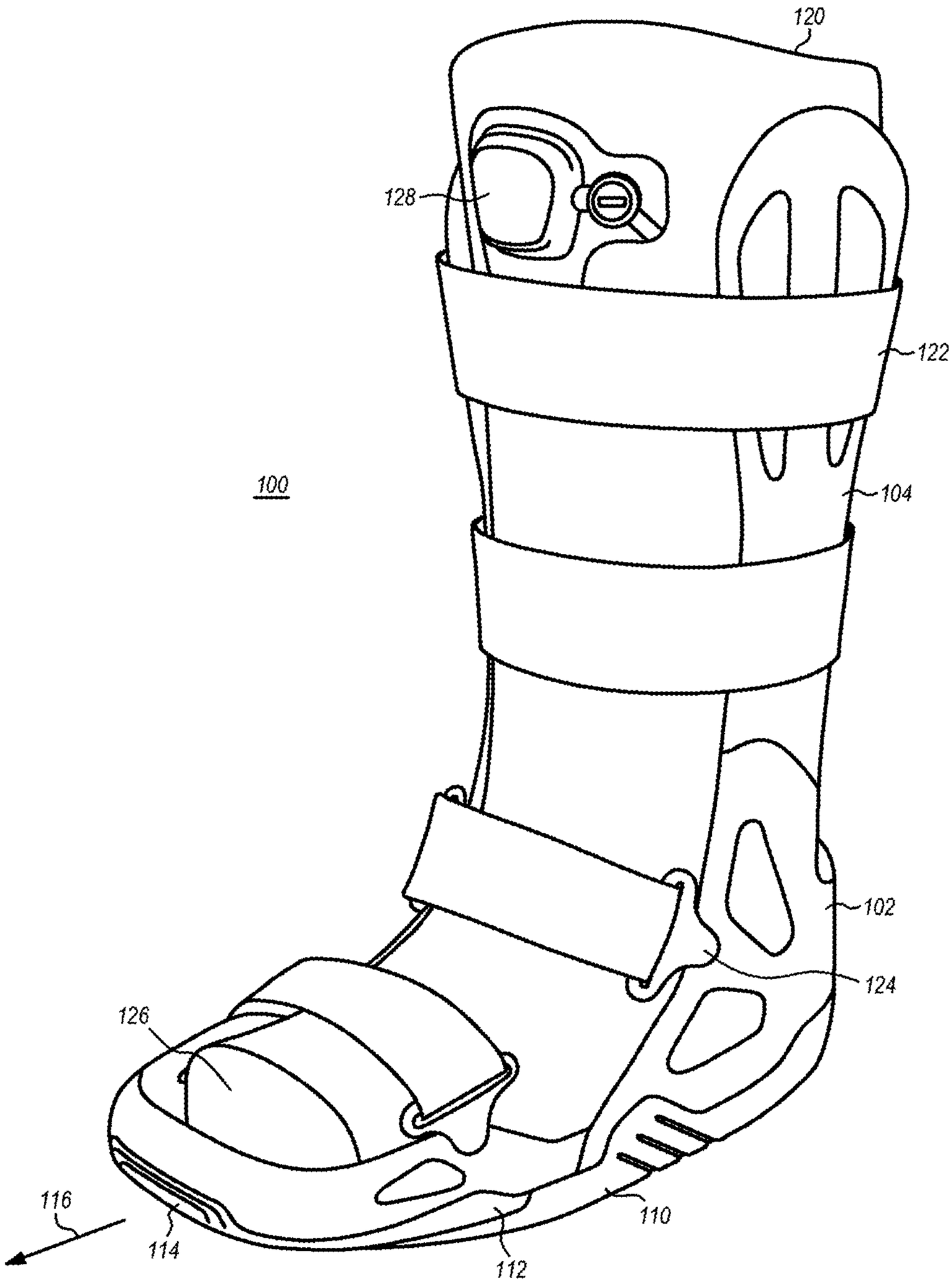


FIG. 1D

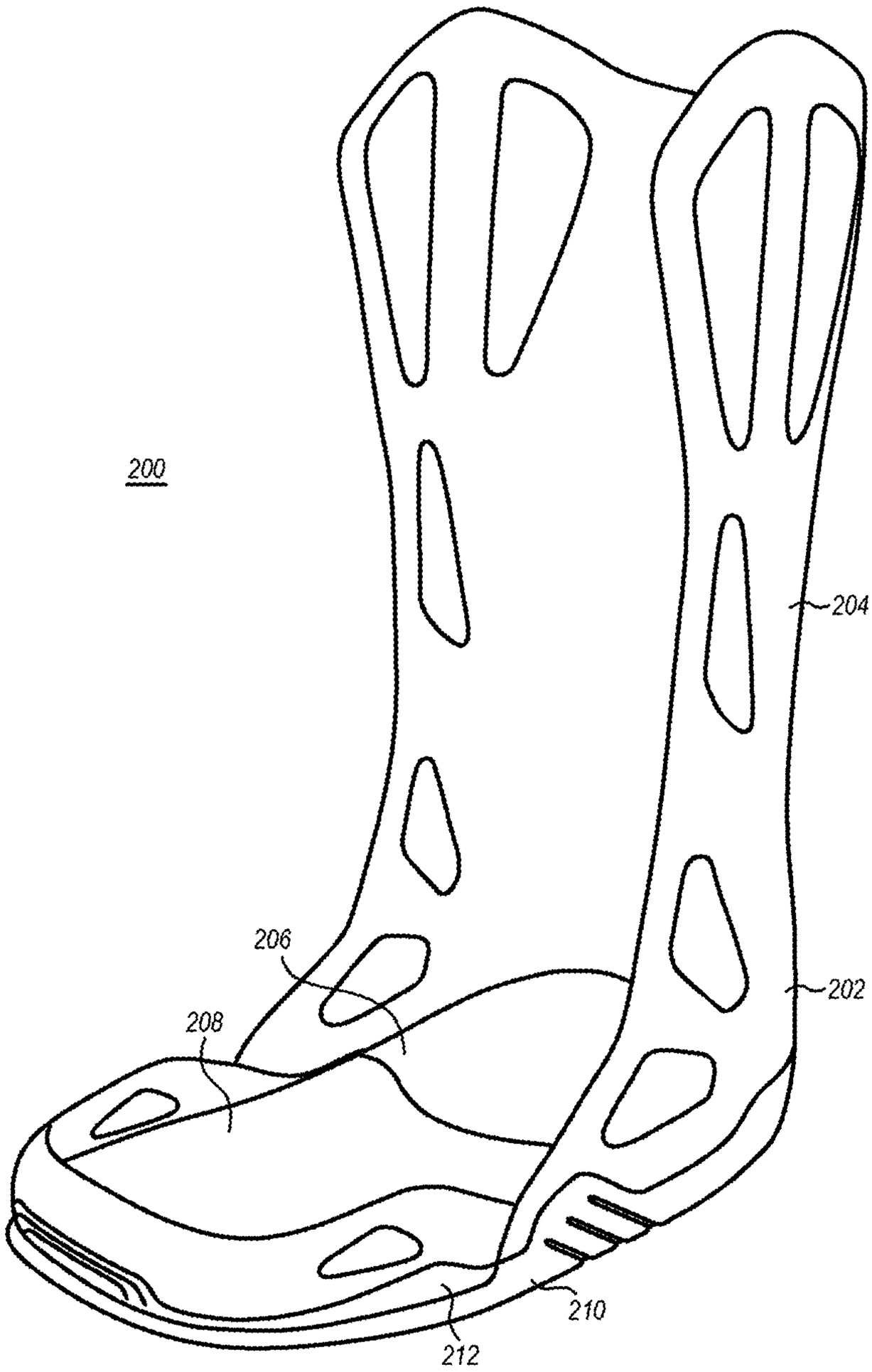


FIG. 2A

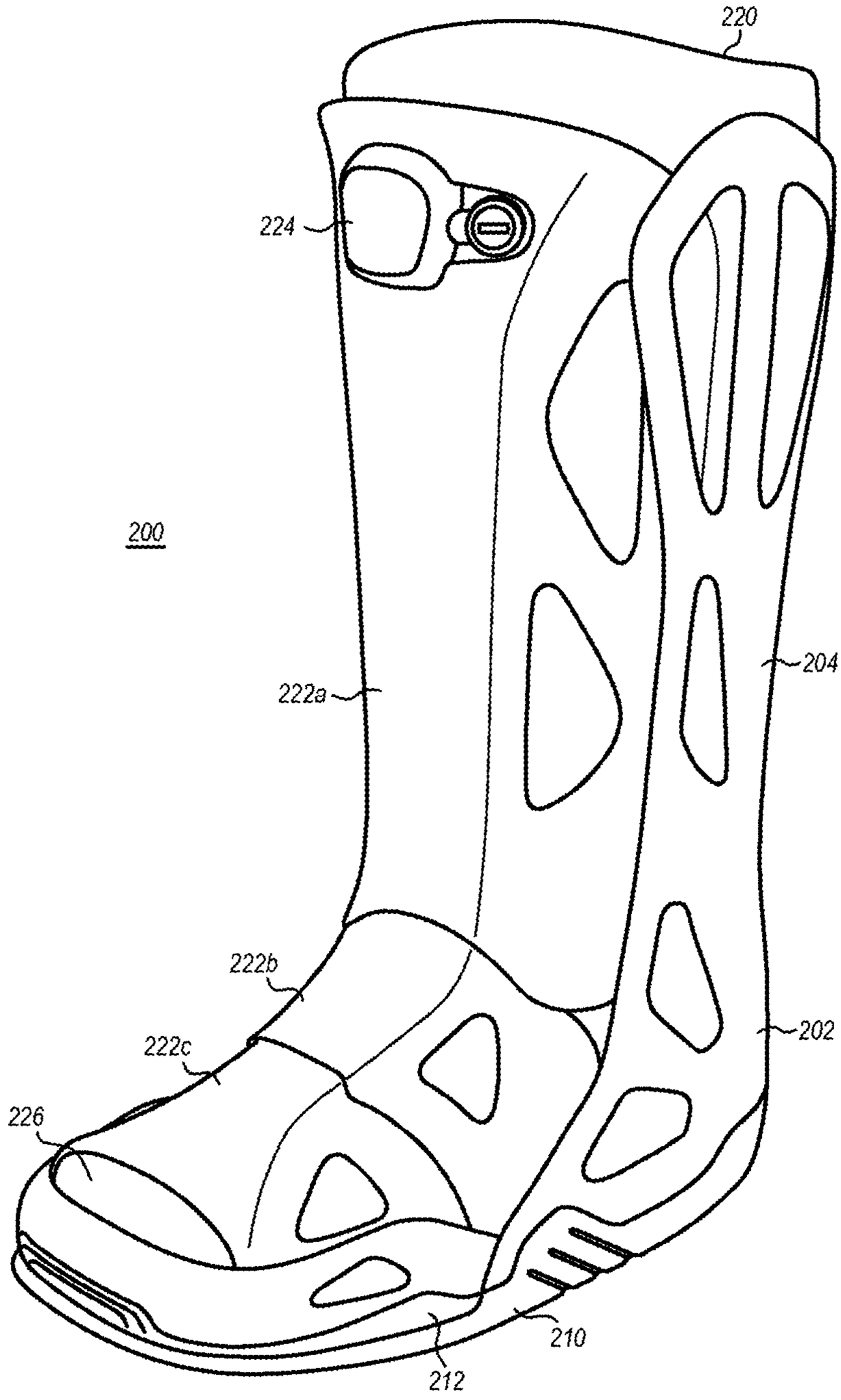


FIG. 2B

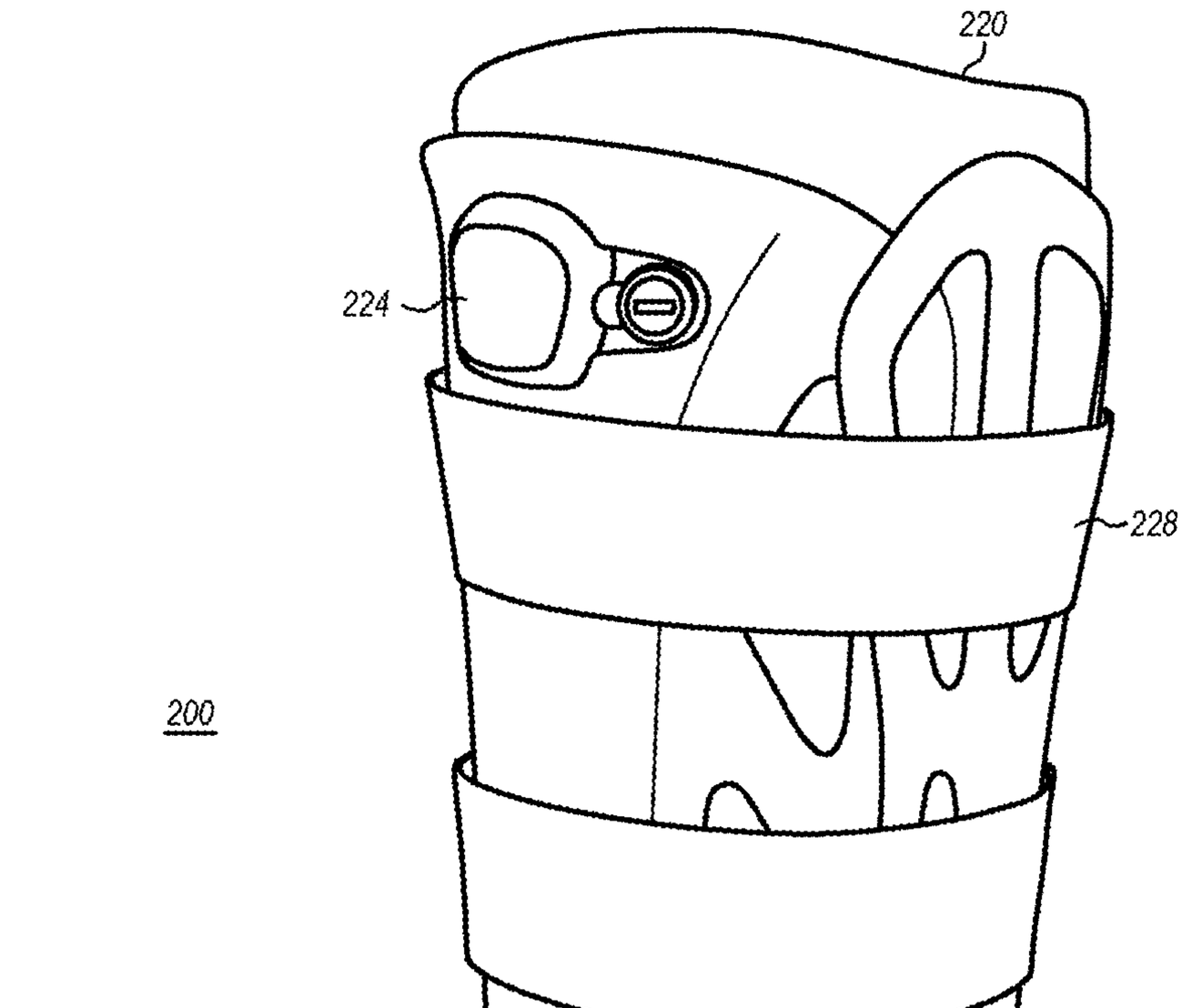


FIG. 2C

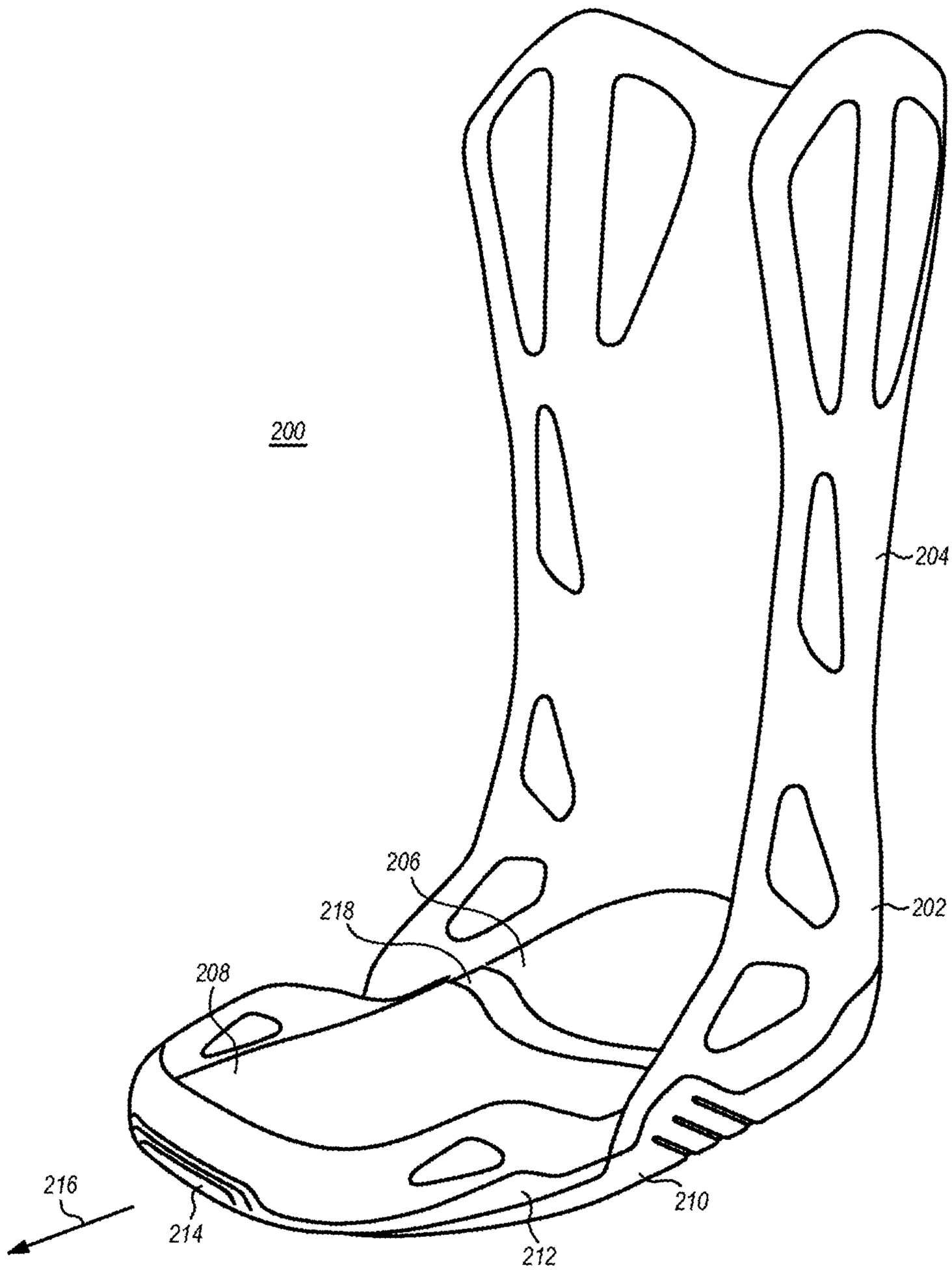


FIG. 2D

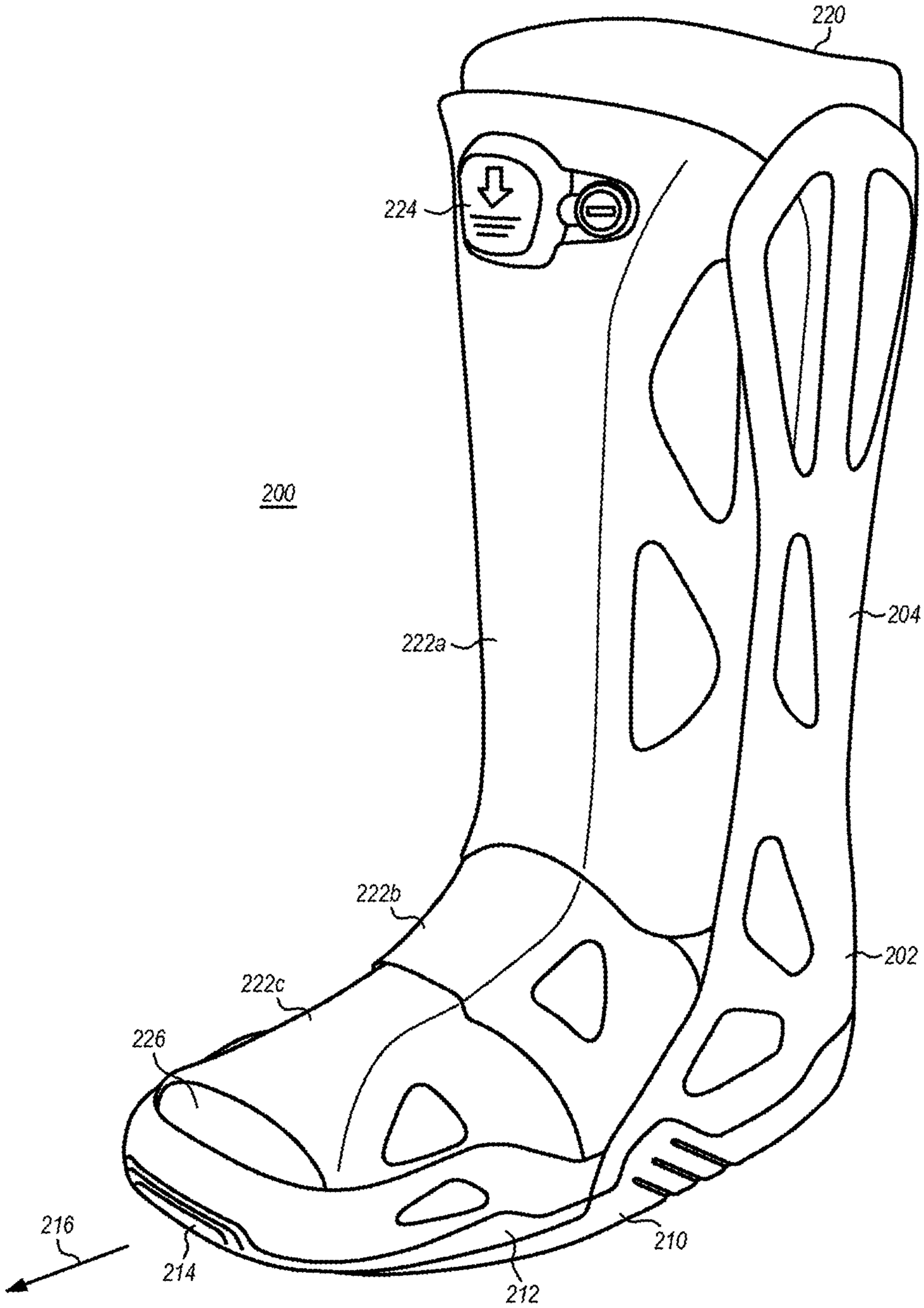


FIG. 2E

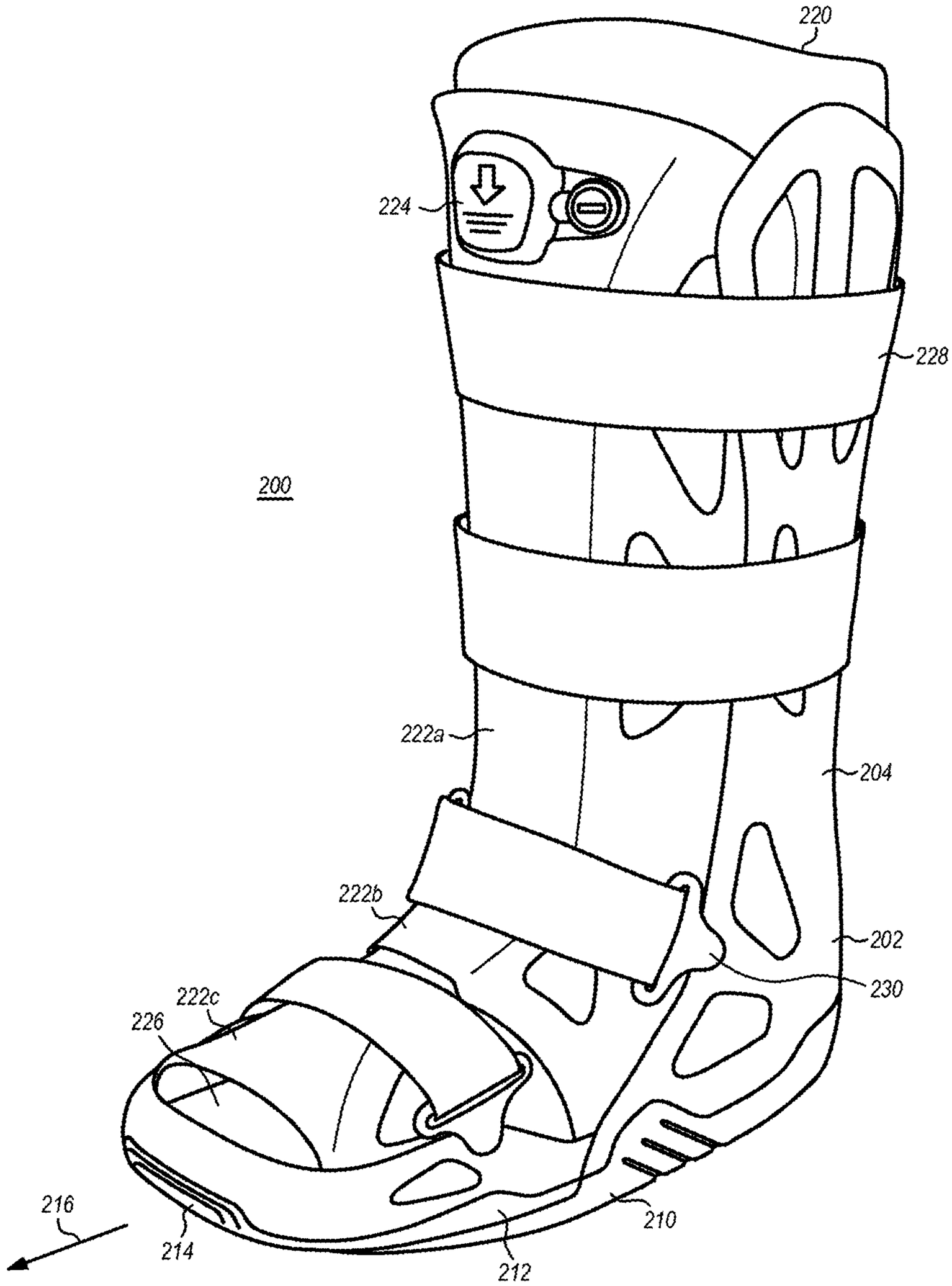


FIG. 2F

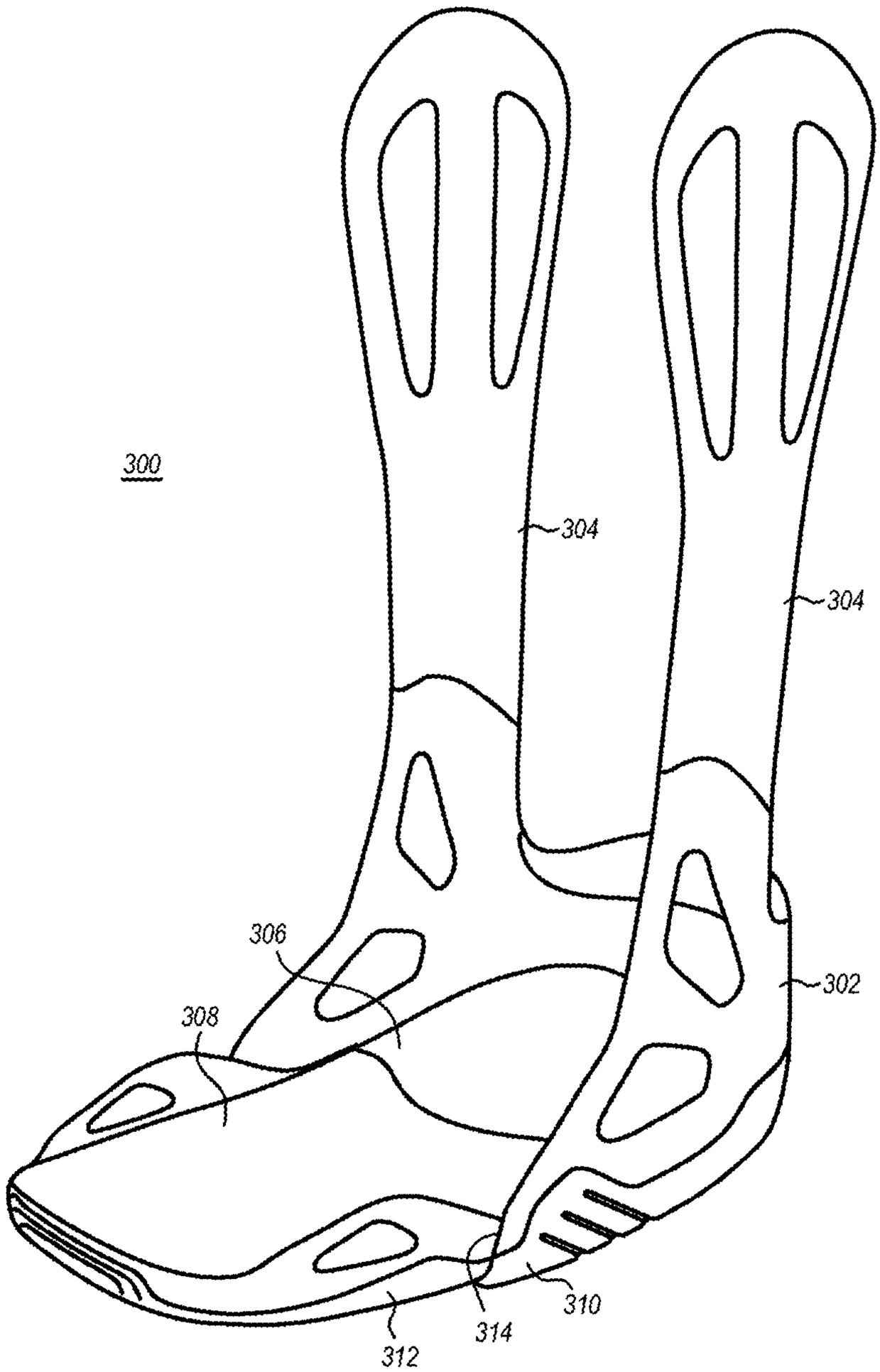


FIG. 3A

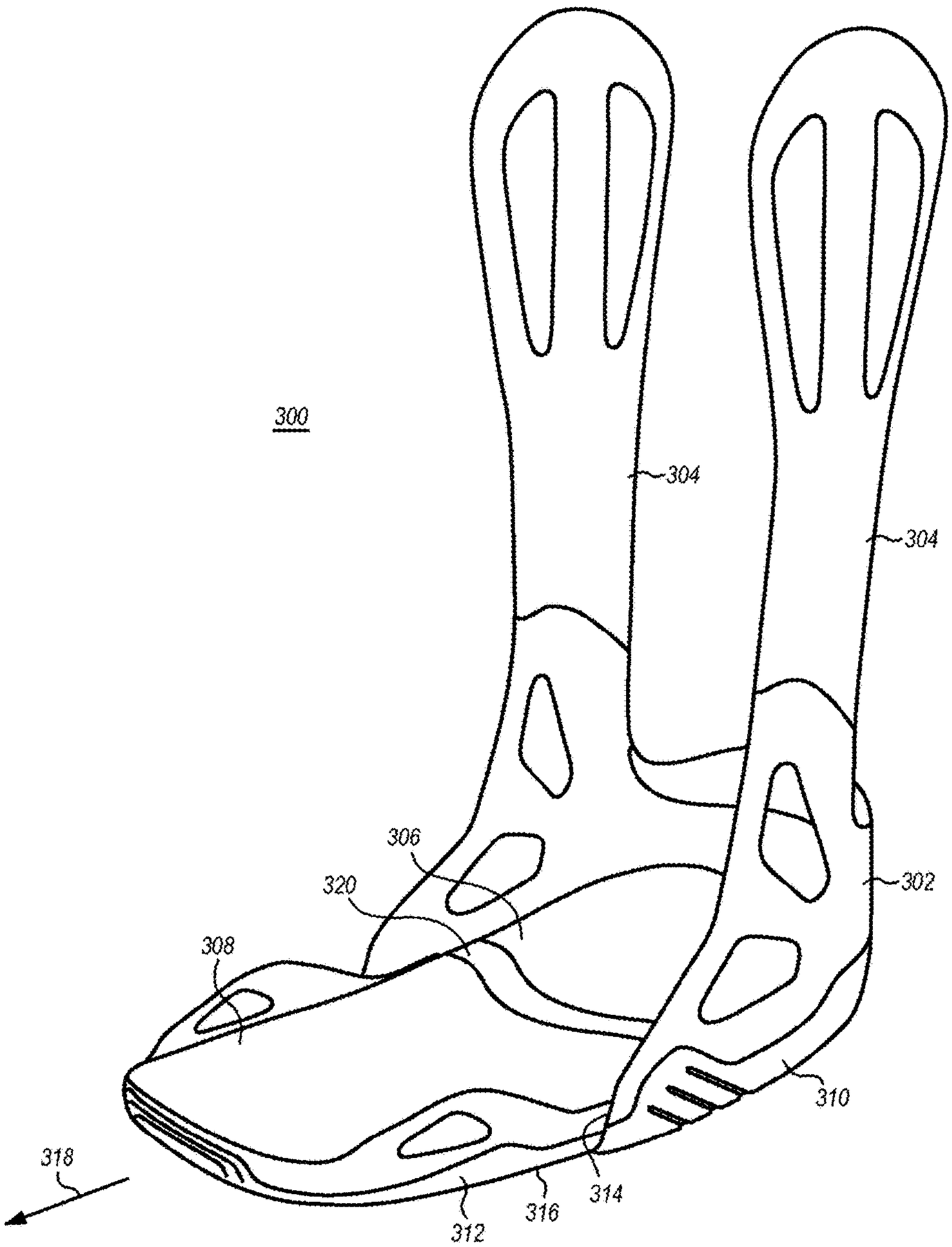


FIG. 3B

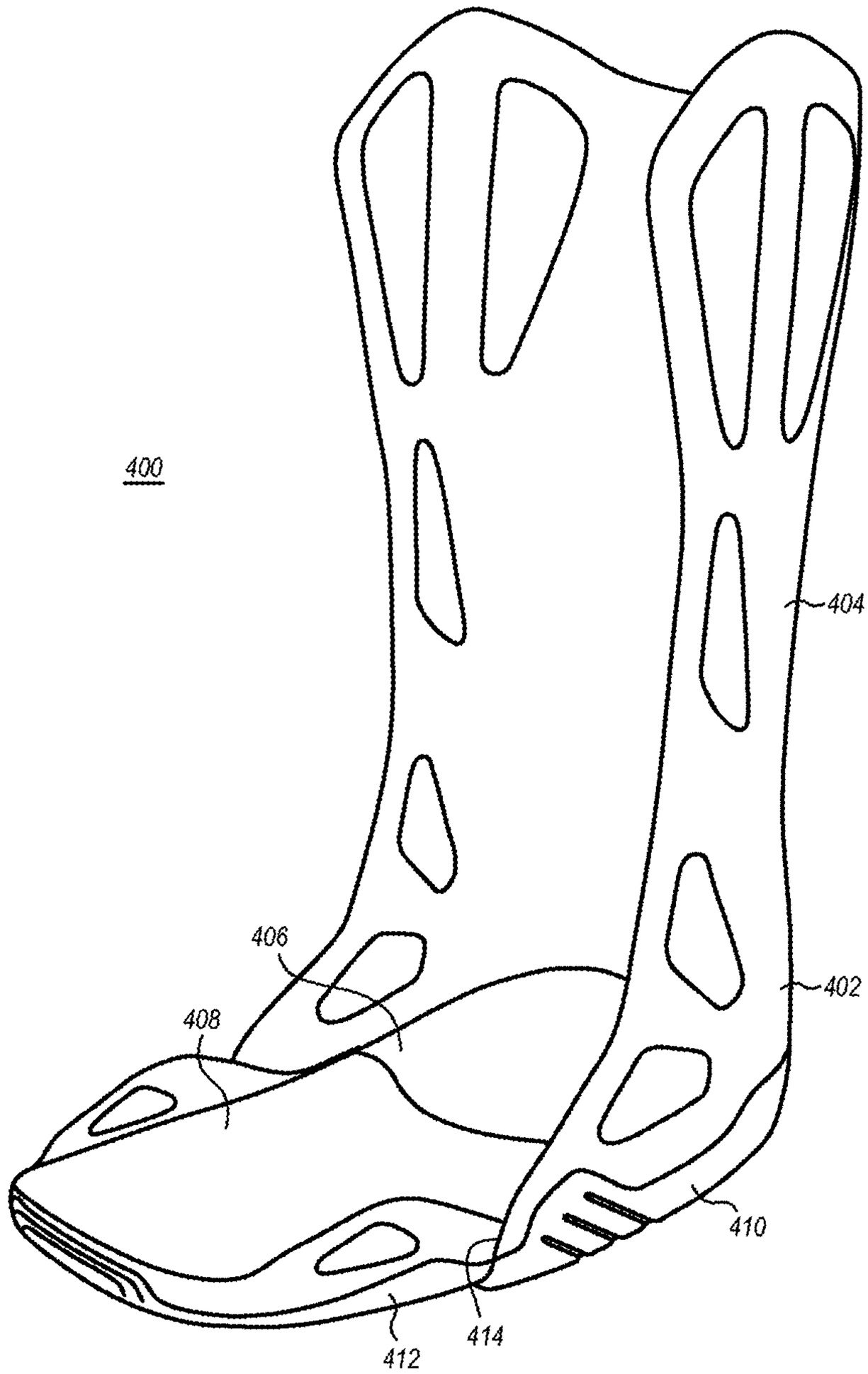


FIG. 4A

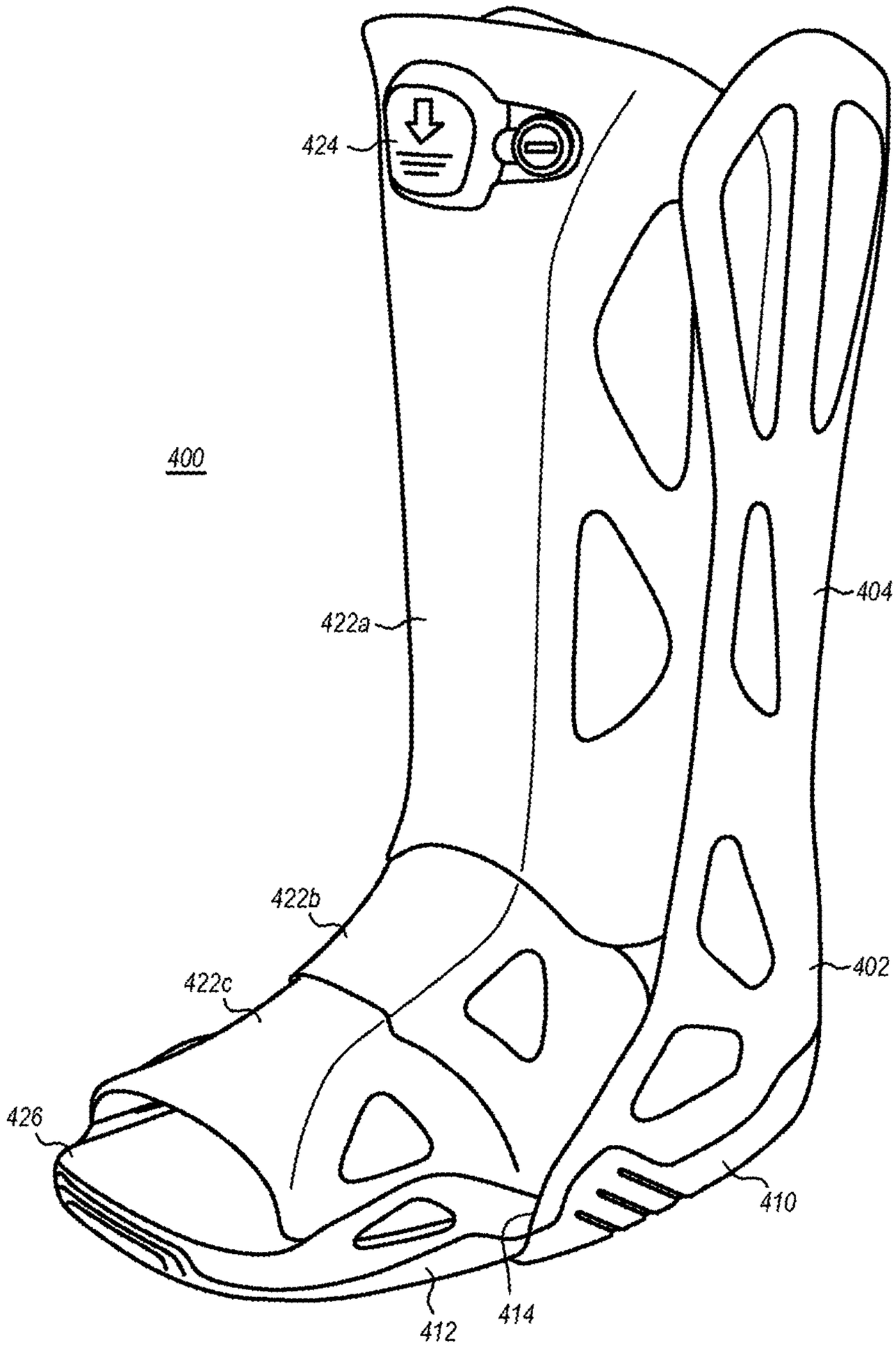


FIG. 4B

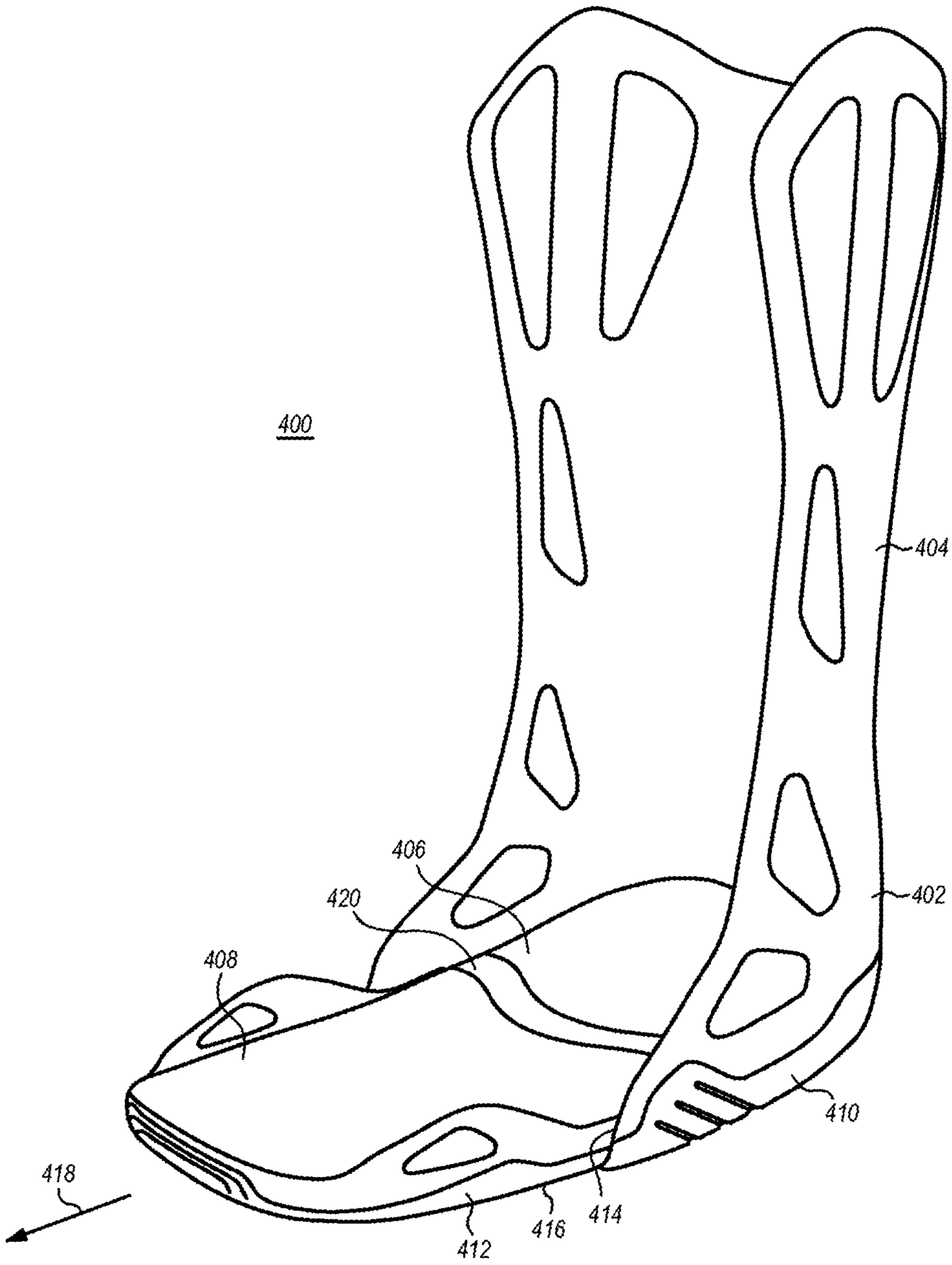


FIG. 4C

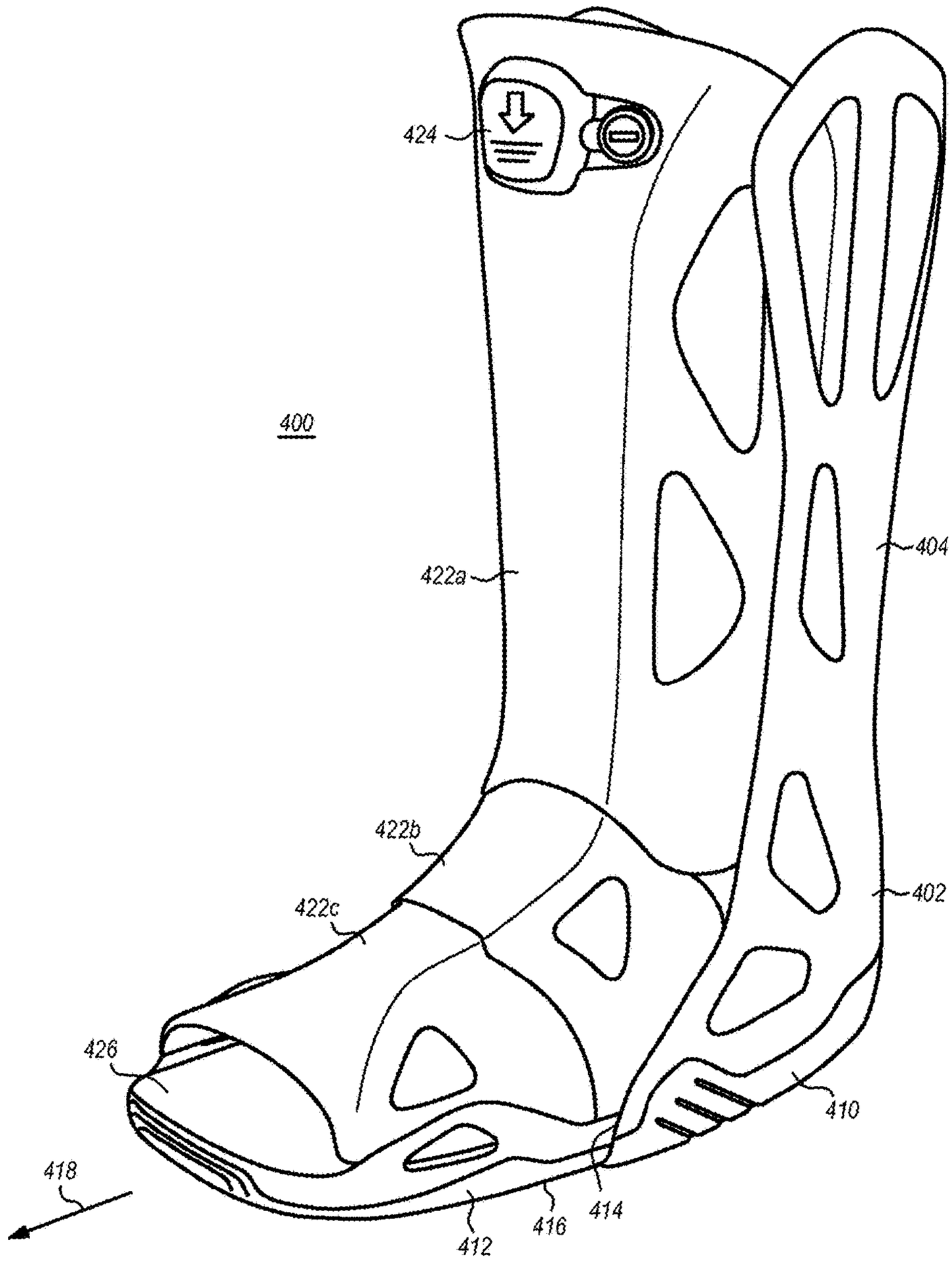
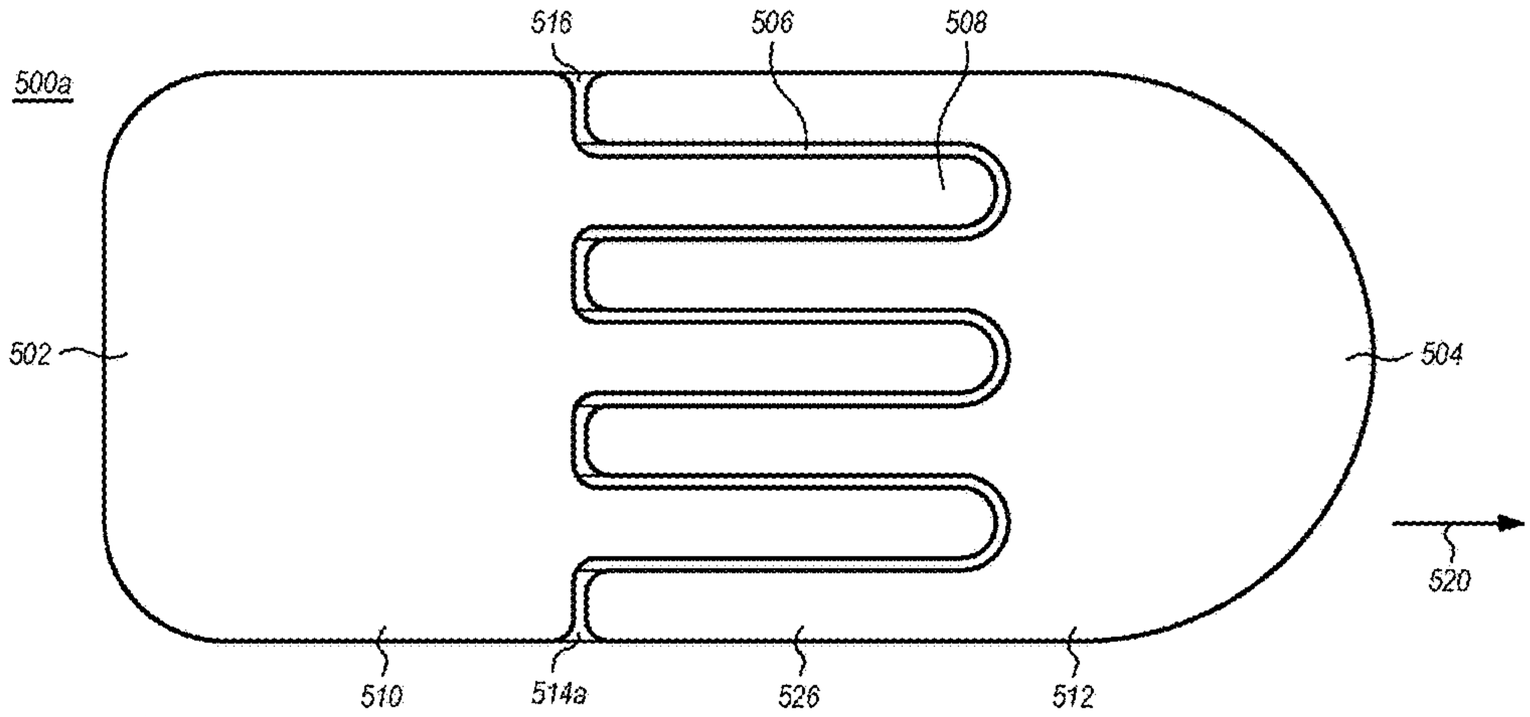


FIG. 4D


516
506
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500a
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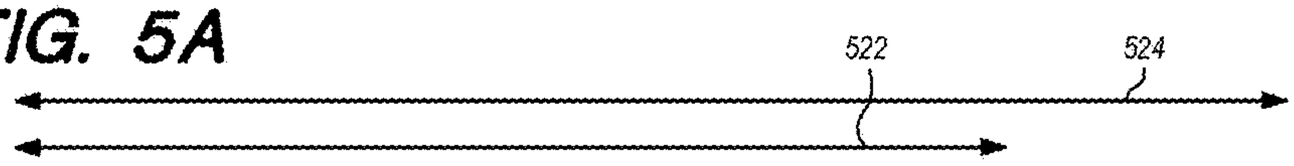
514a
526
512

FIG. 5A


522
524

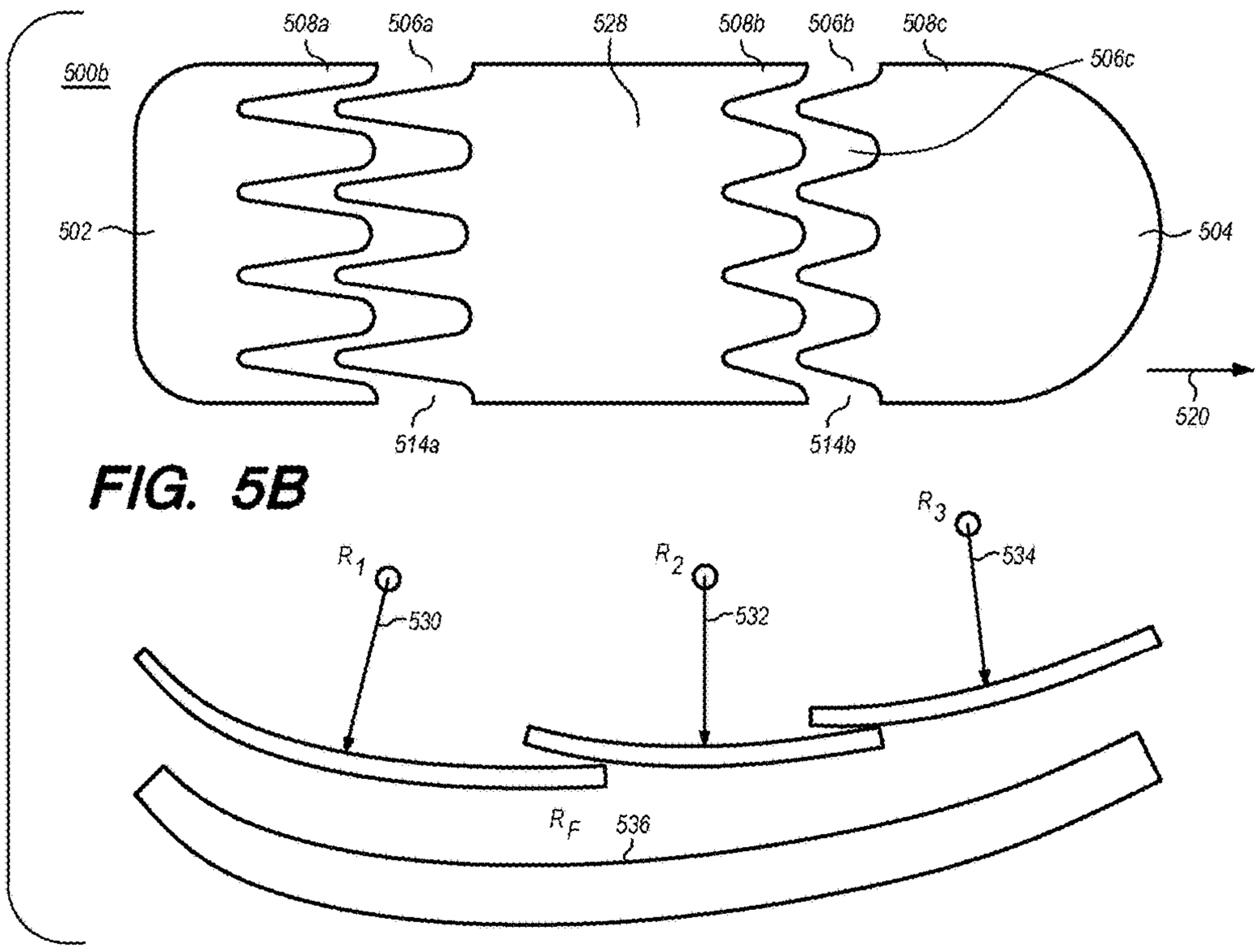
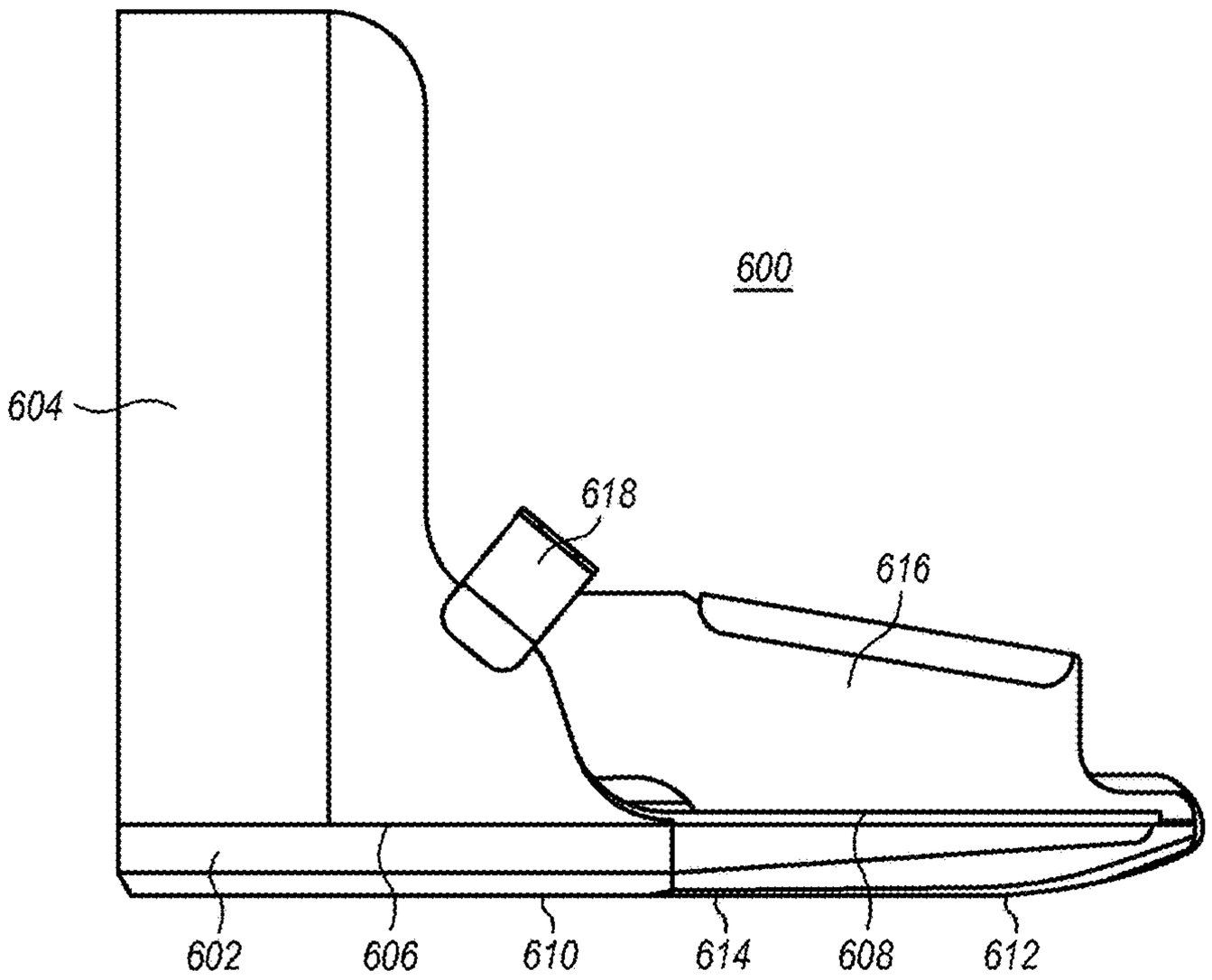

508a
506a
528
508b
506b
508c
506c
500b
502
504
520
514a
514b
R_1
530
R_2
532
R_3
534
R_F
536

FIG. 5B


600
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618
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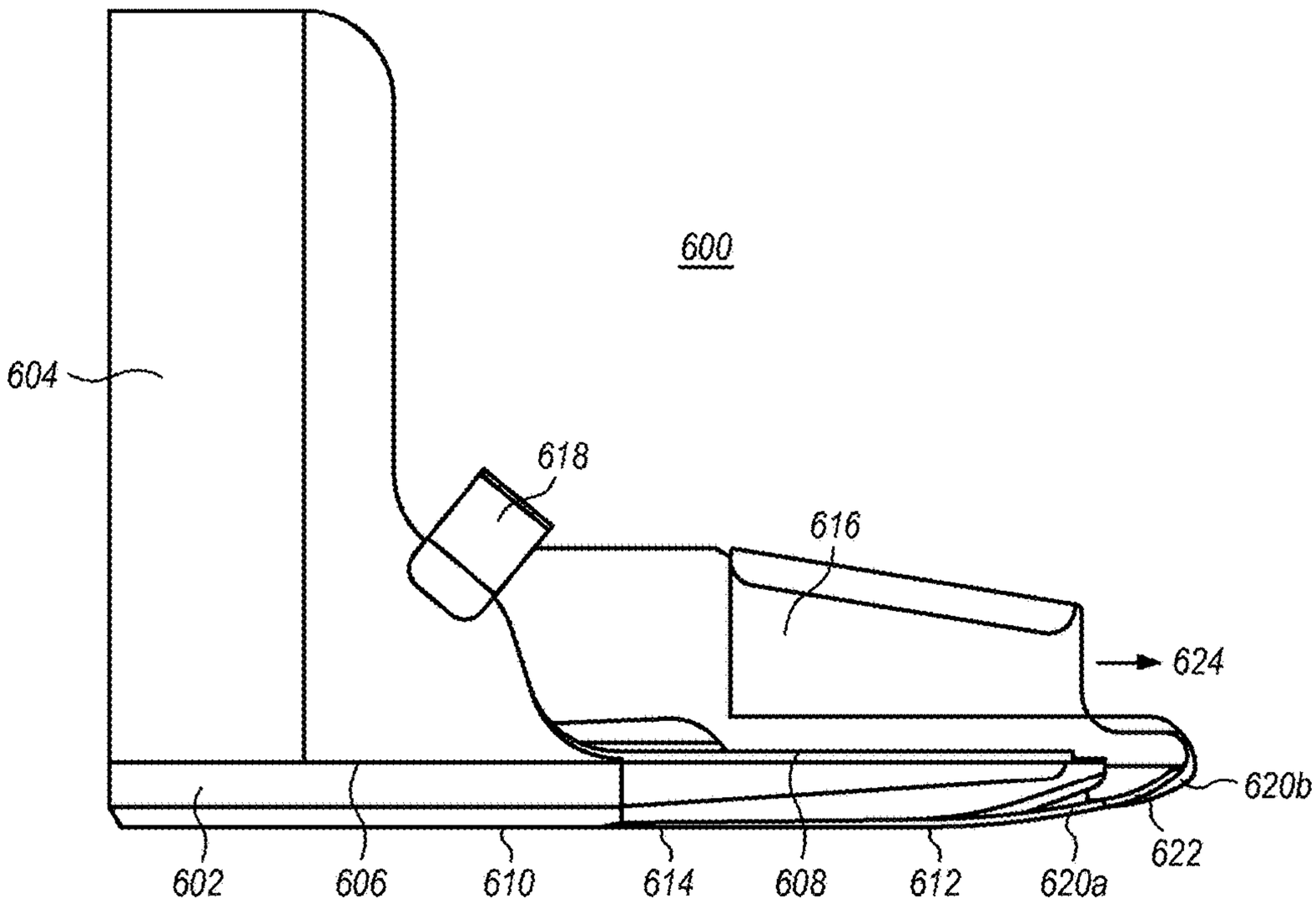
FIG. 6A


600
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624
620b
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612
620a

FIG. 6B

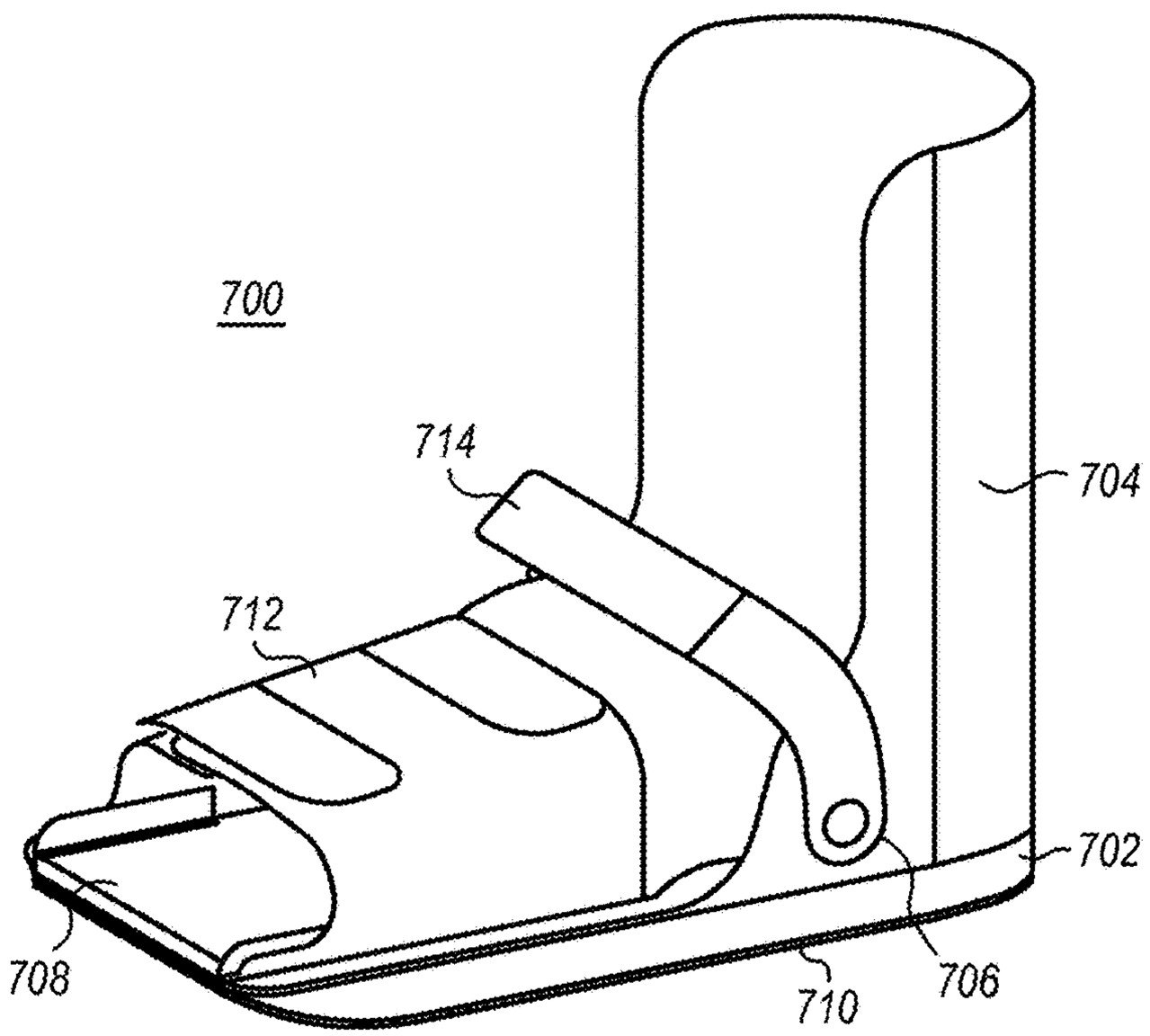

FIG. 7A

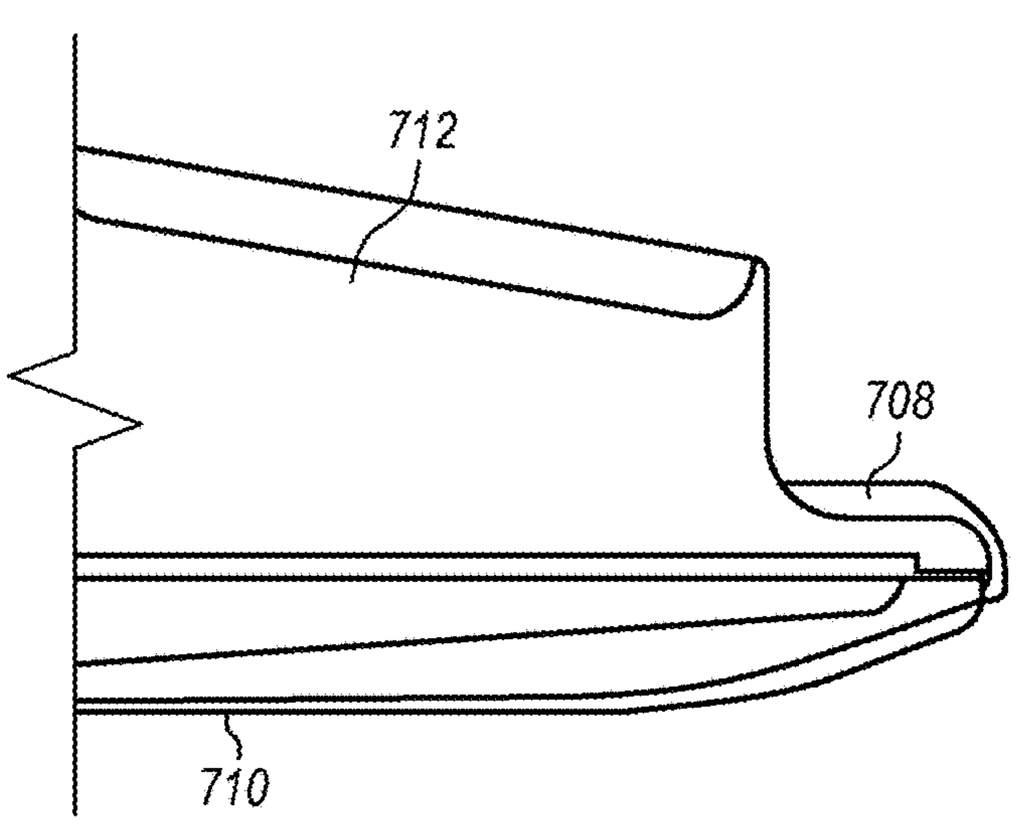

FIG. 7B

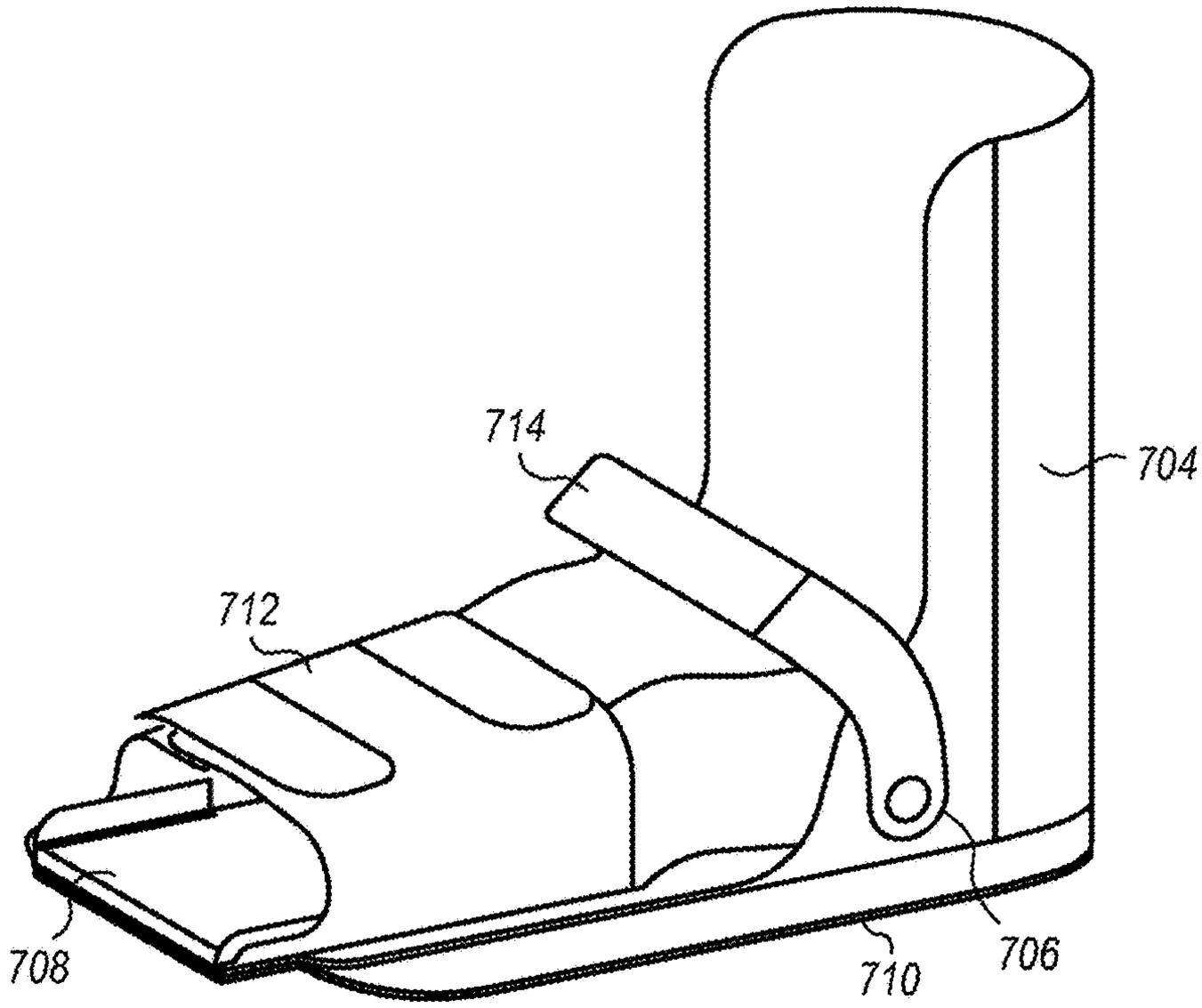

FIG. 7C

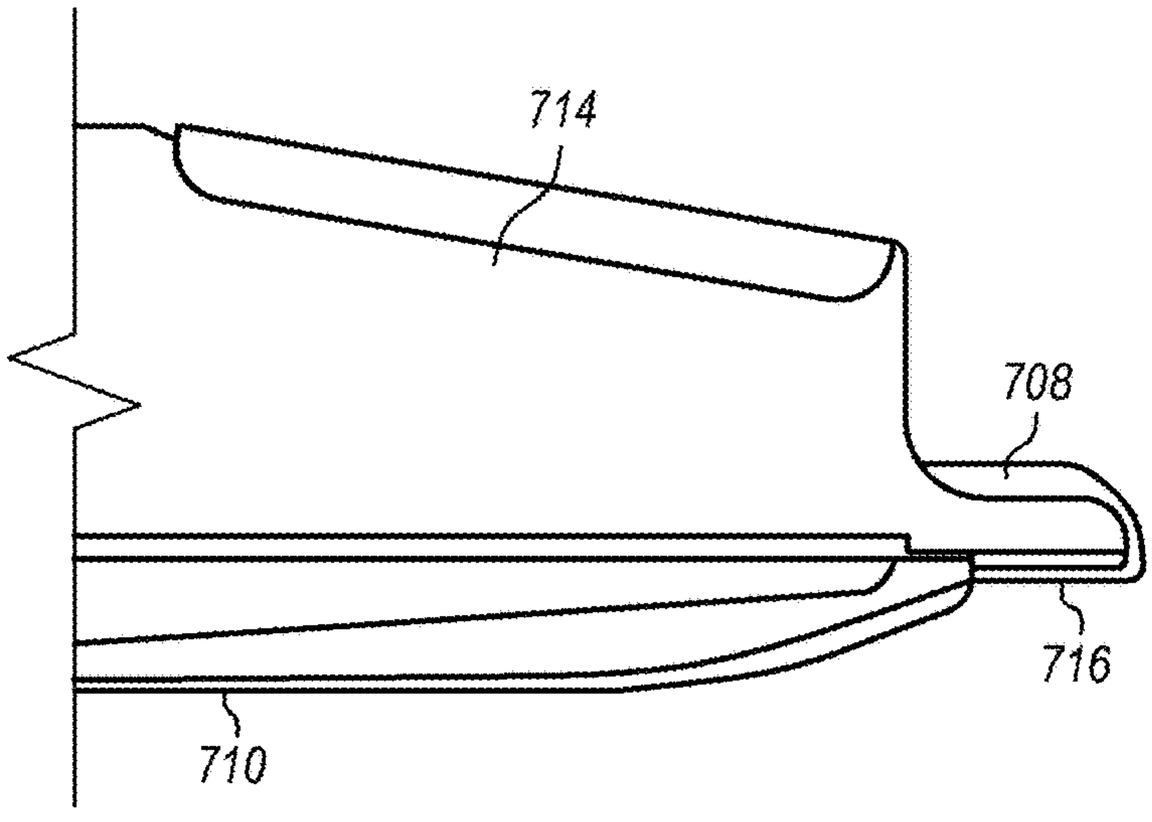

FIG. 7D

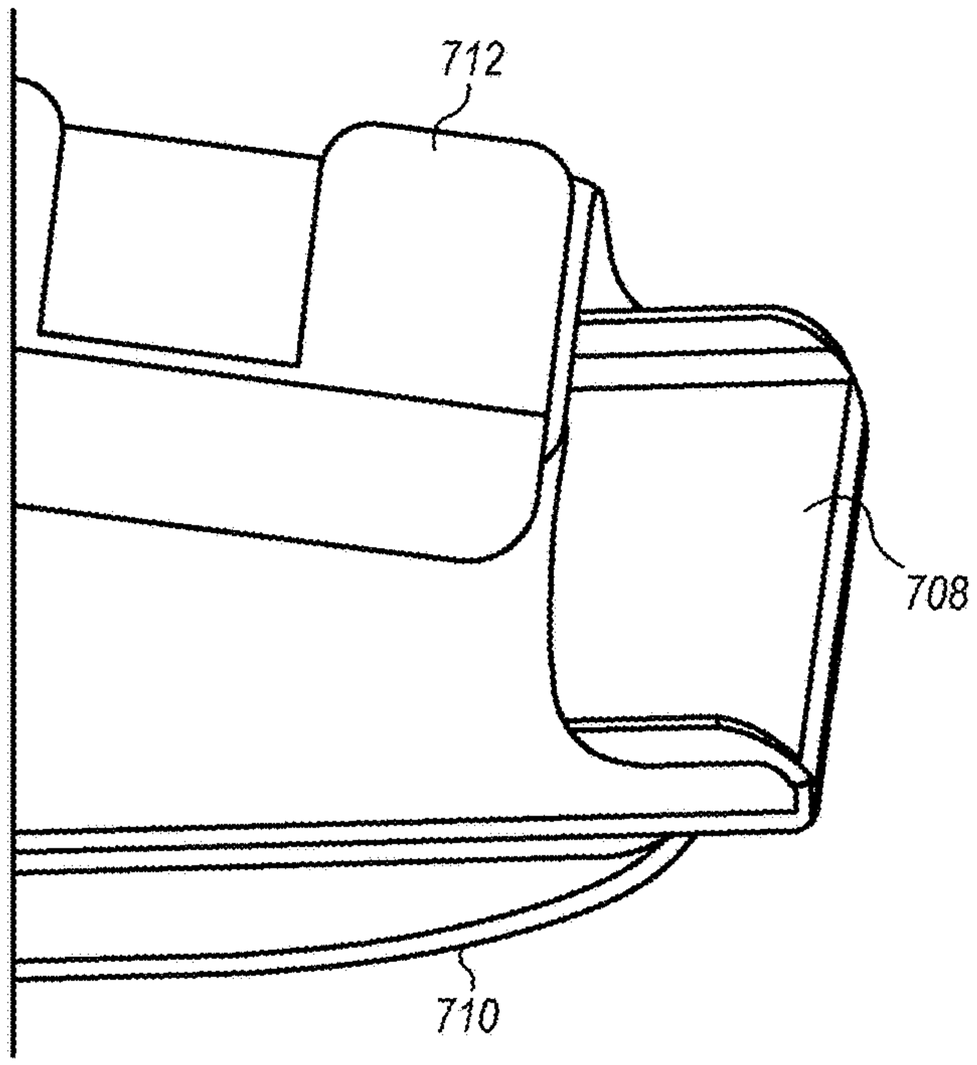

FIG. 7E

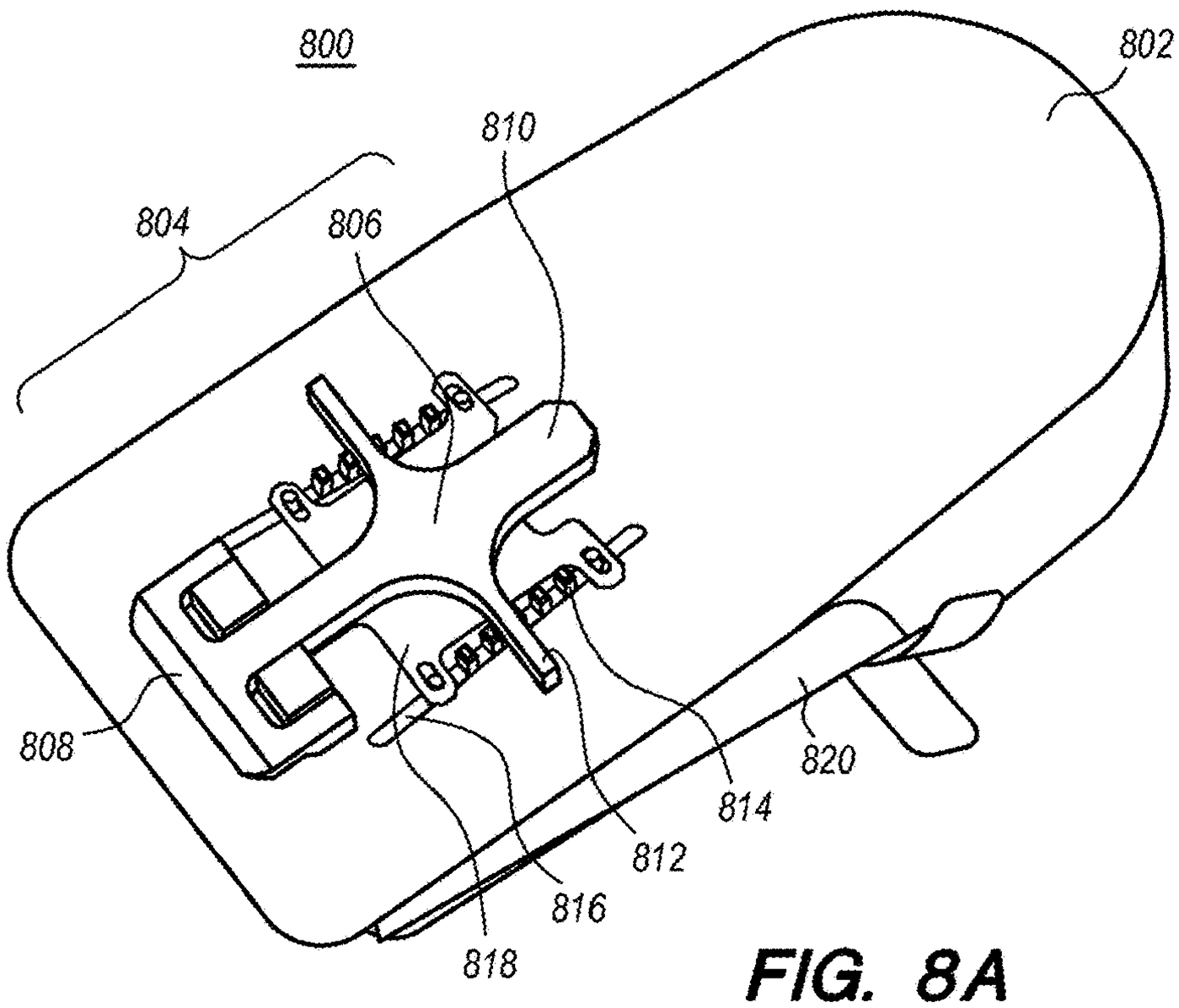

FIG. 8A

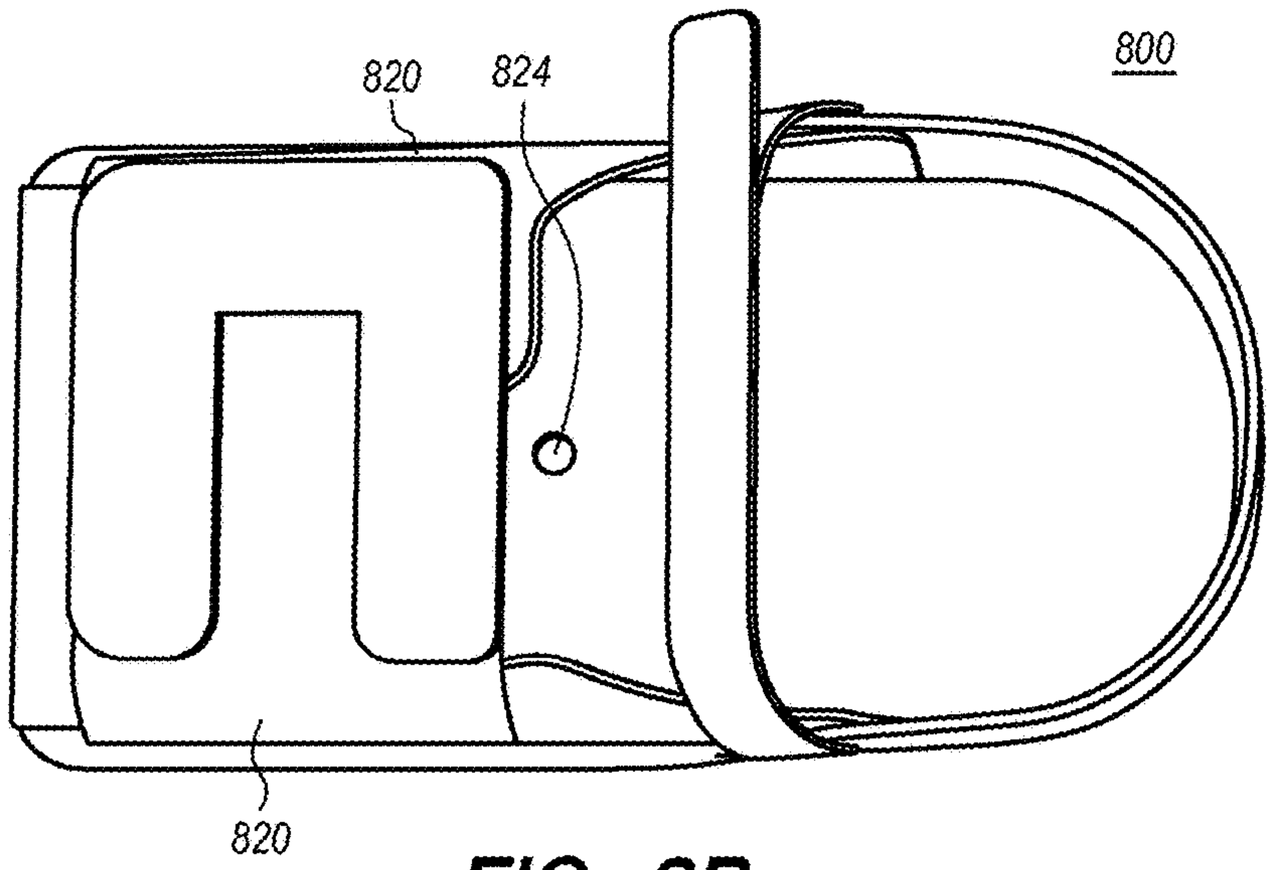

FIG. 8B

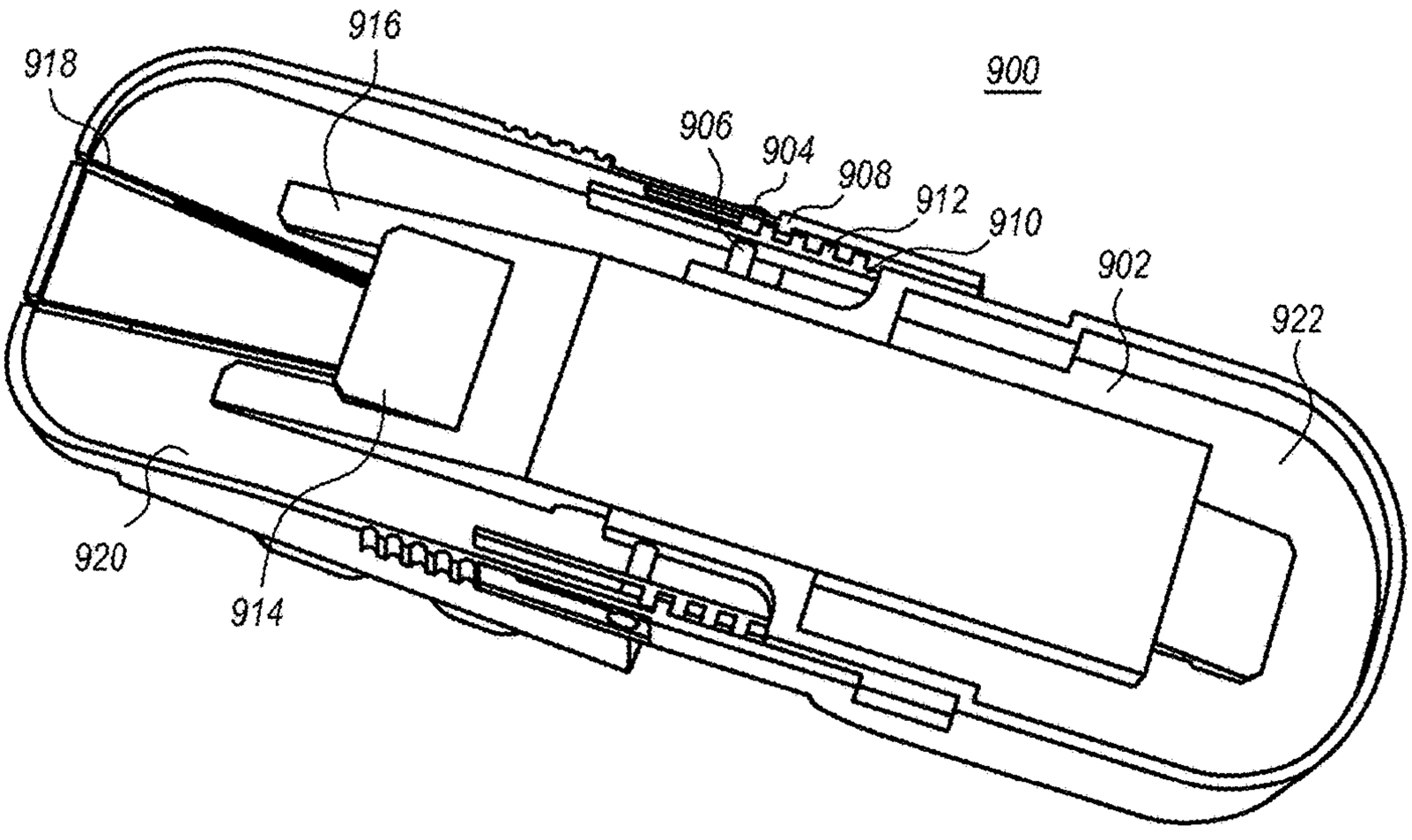

FIG. 9A

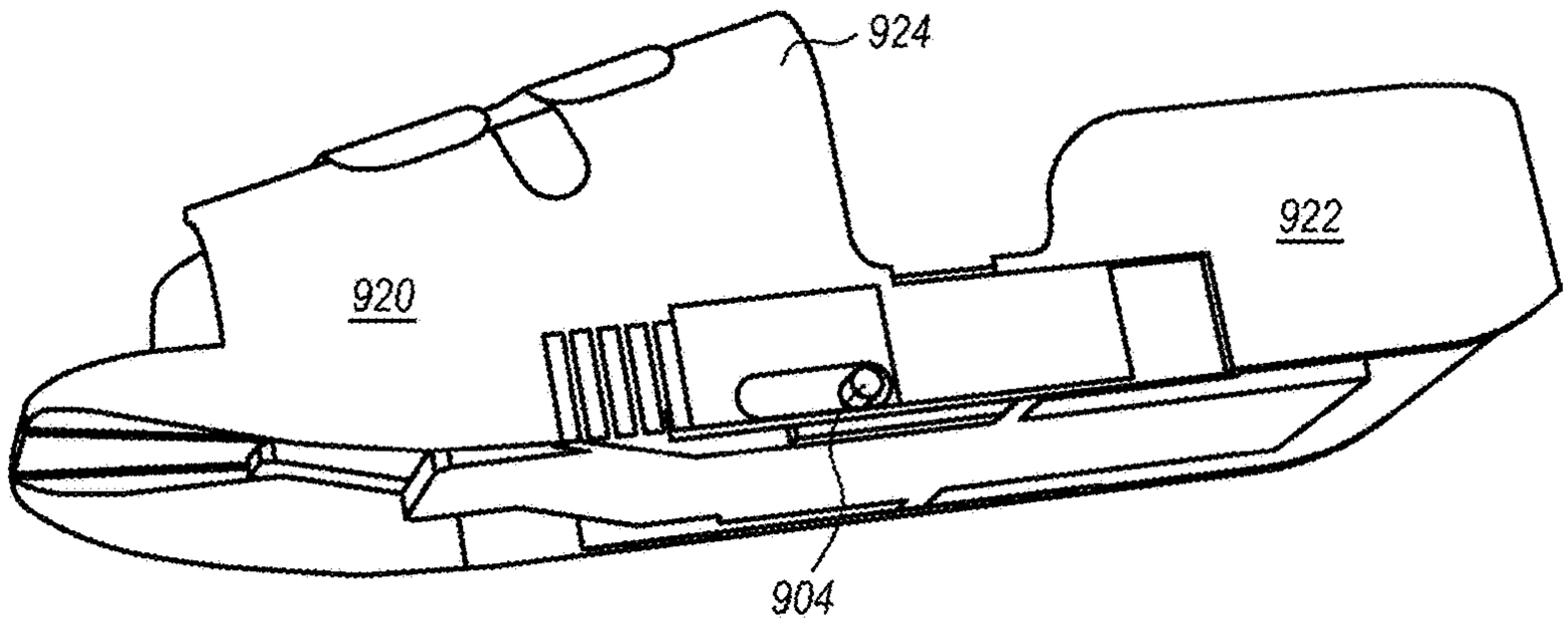

FIG. 9B

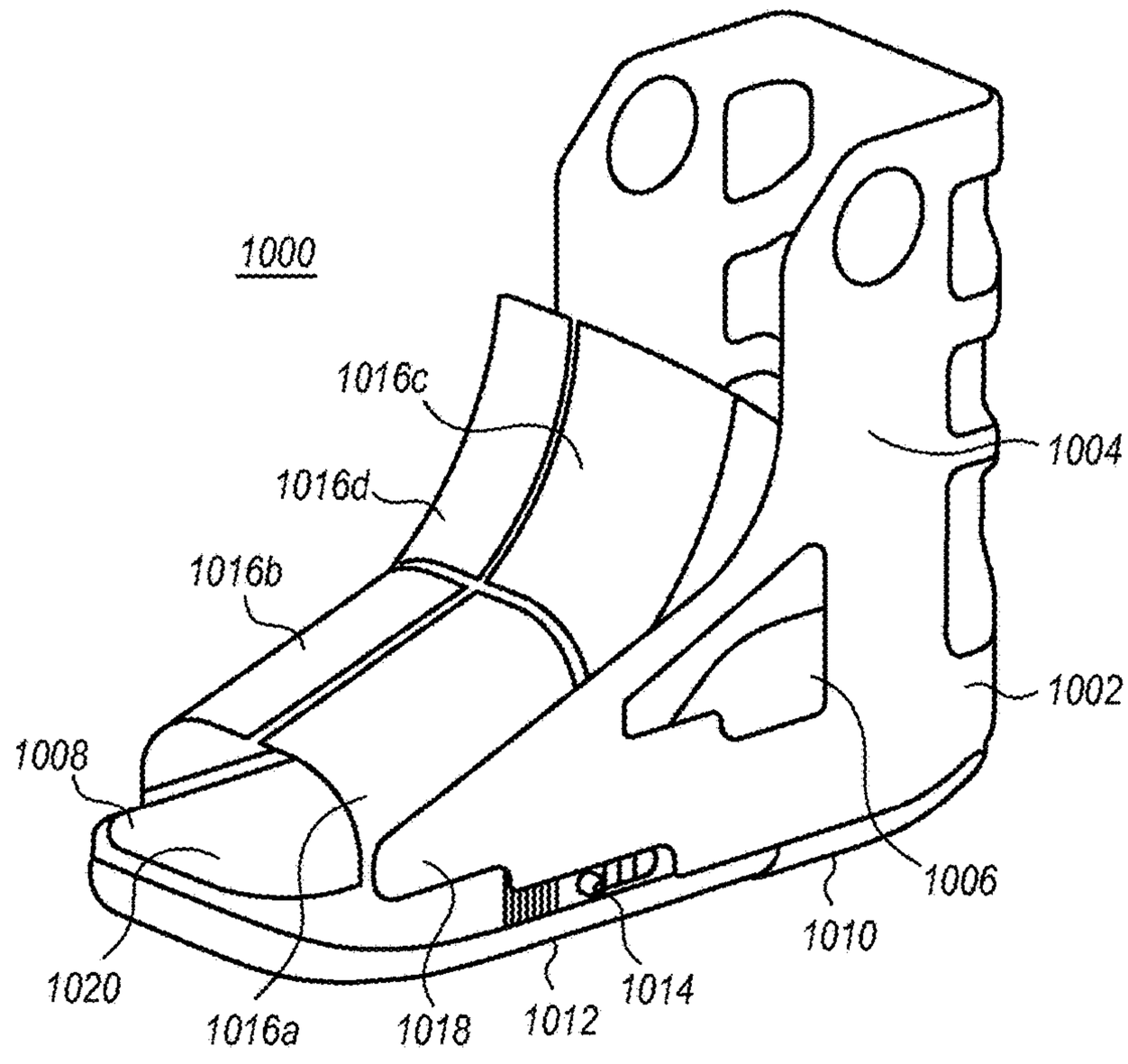

FIG. 10A

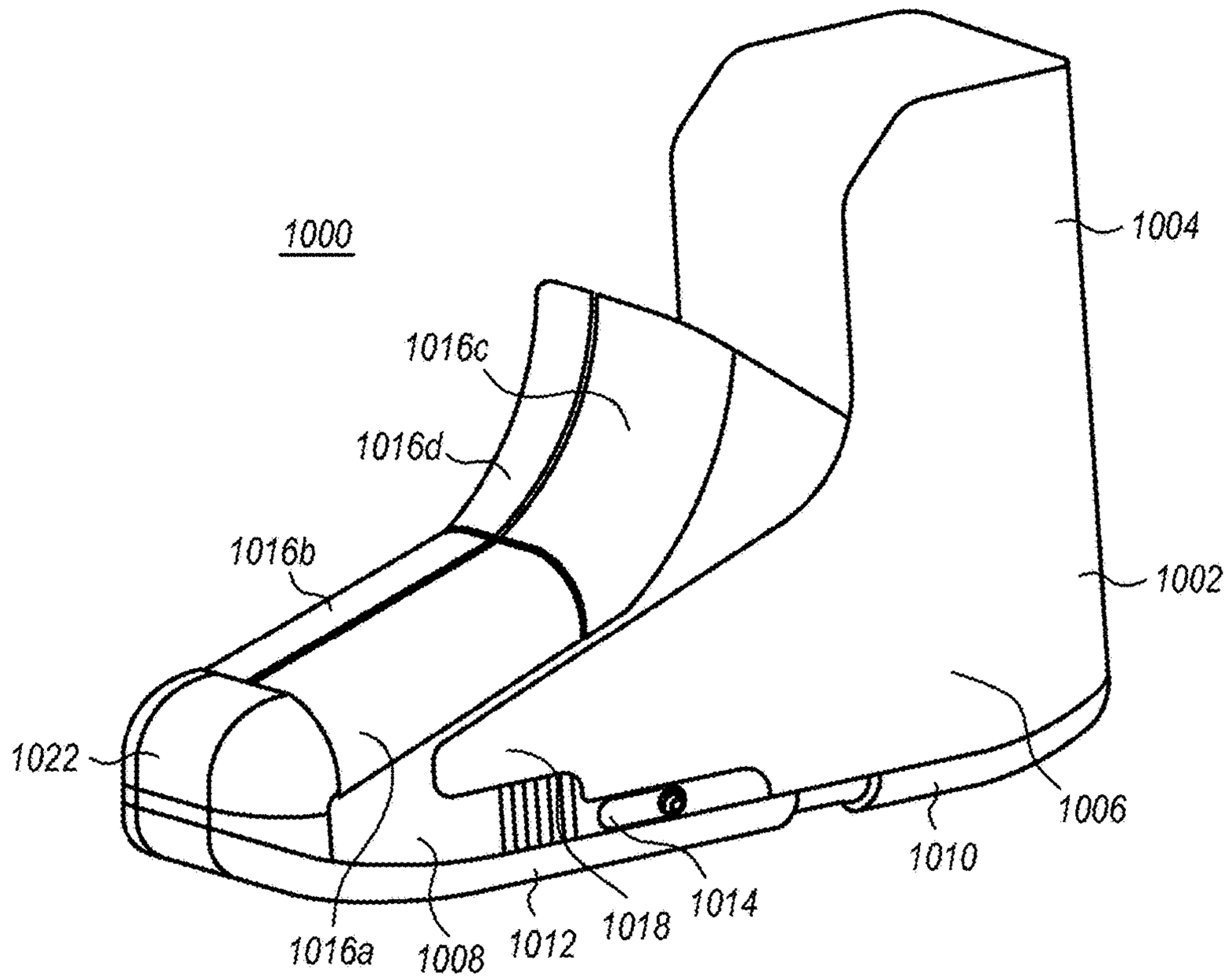

FIG. 10B

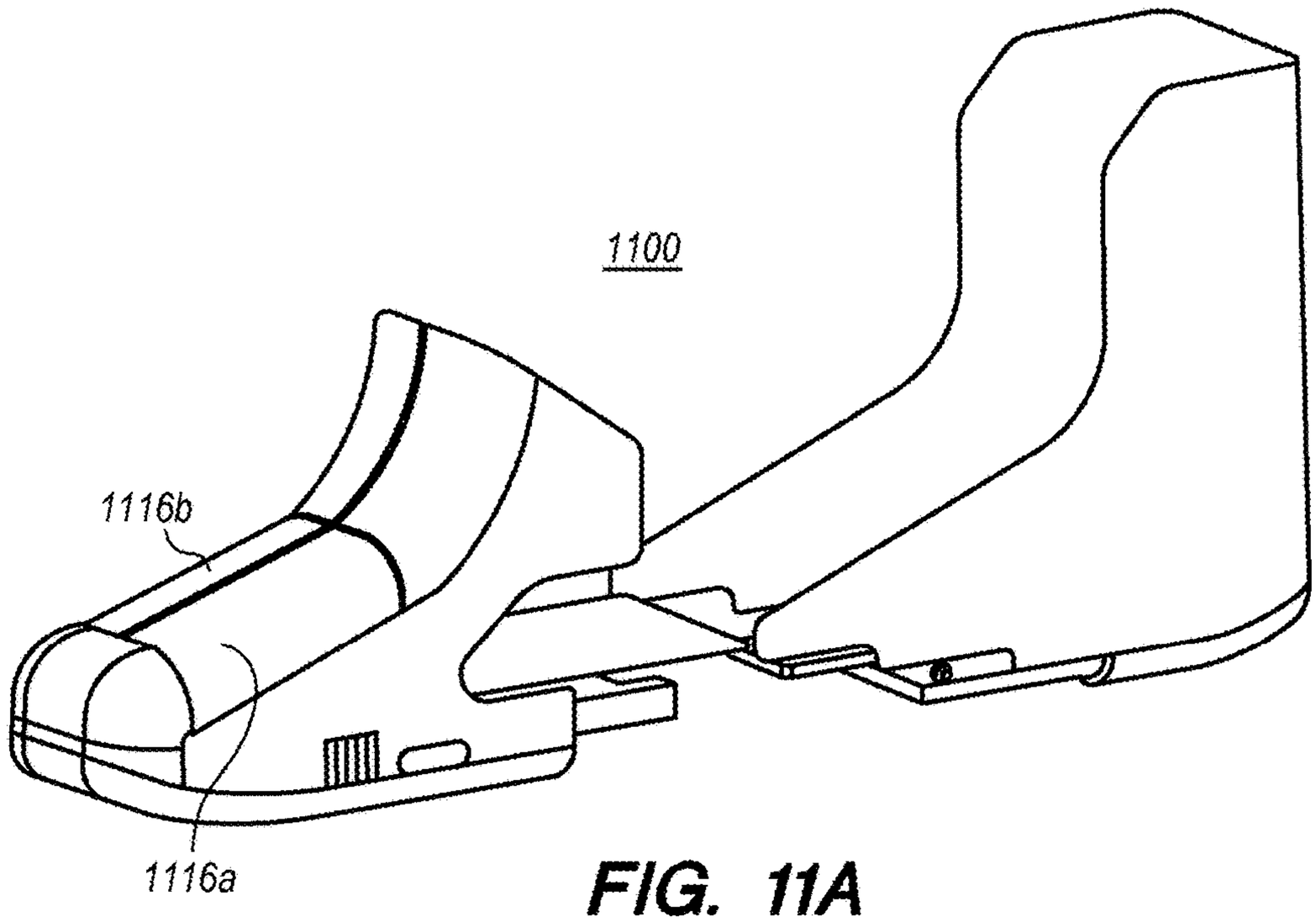

FIG. 11A

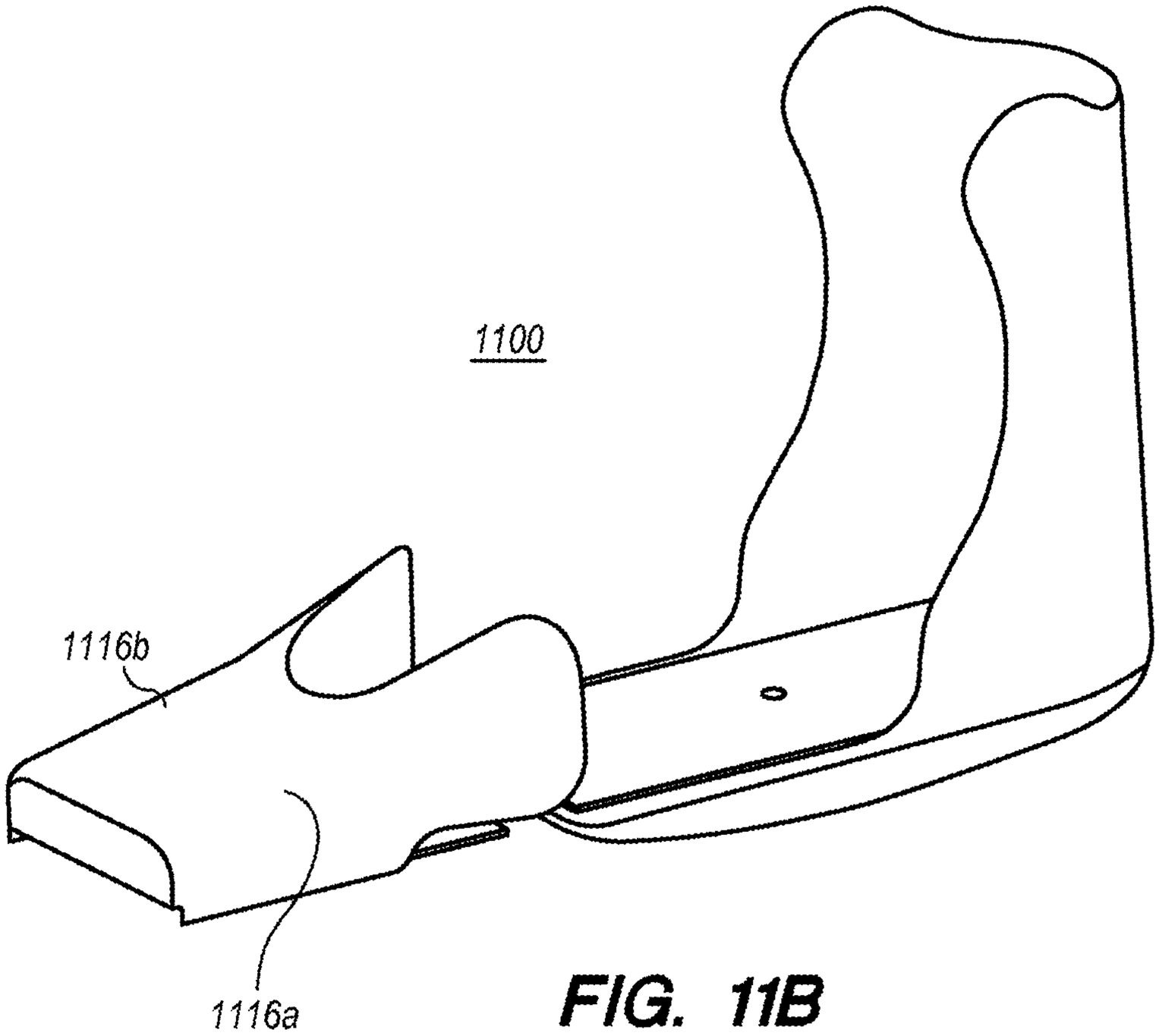

FIG. 11B

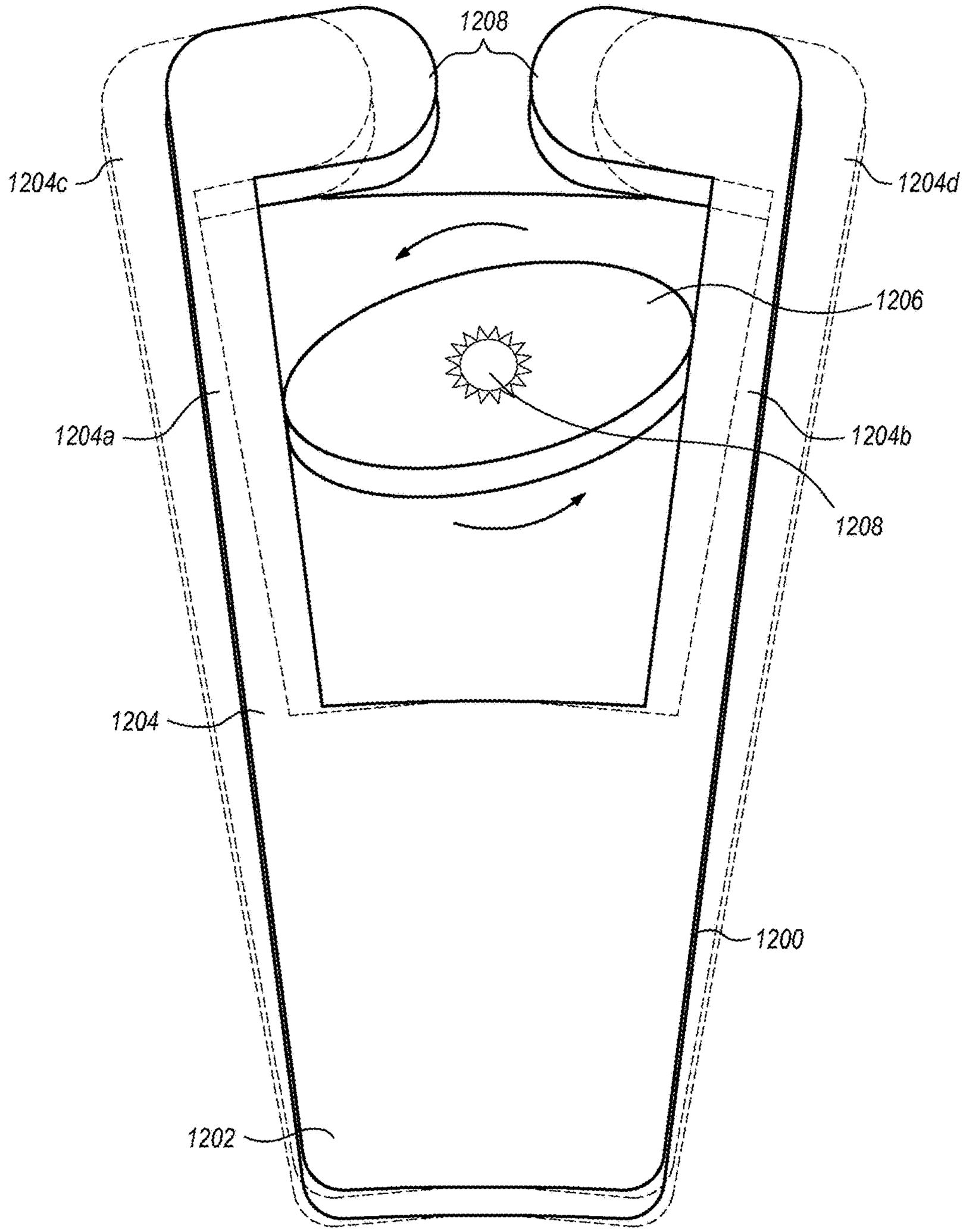

FIG. 12

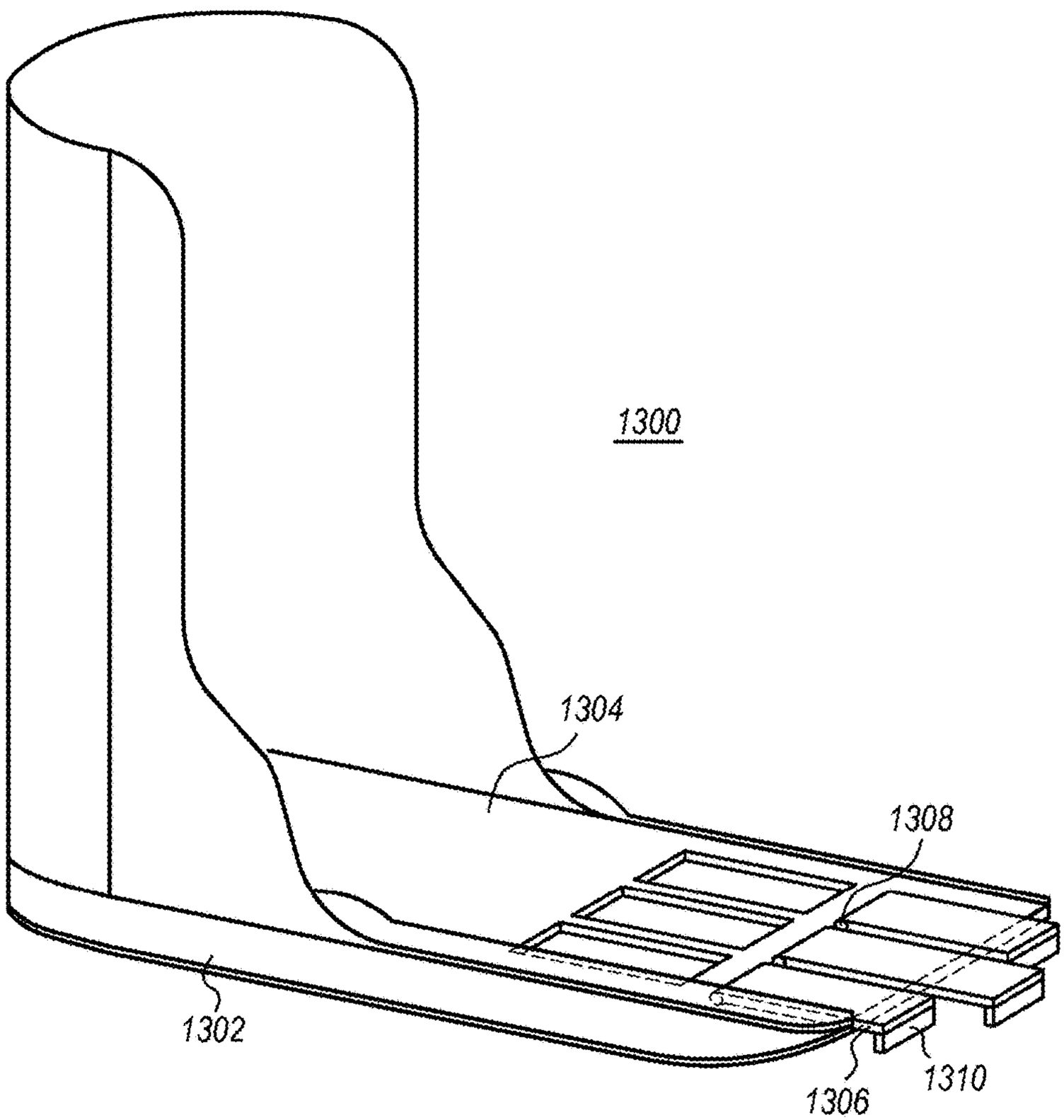

FIG. 13A

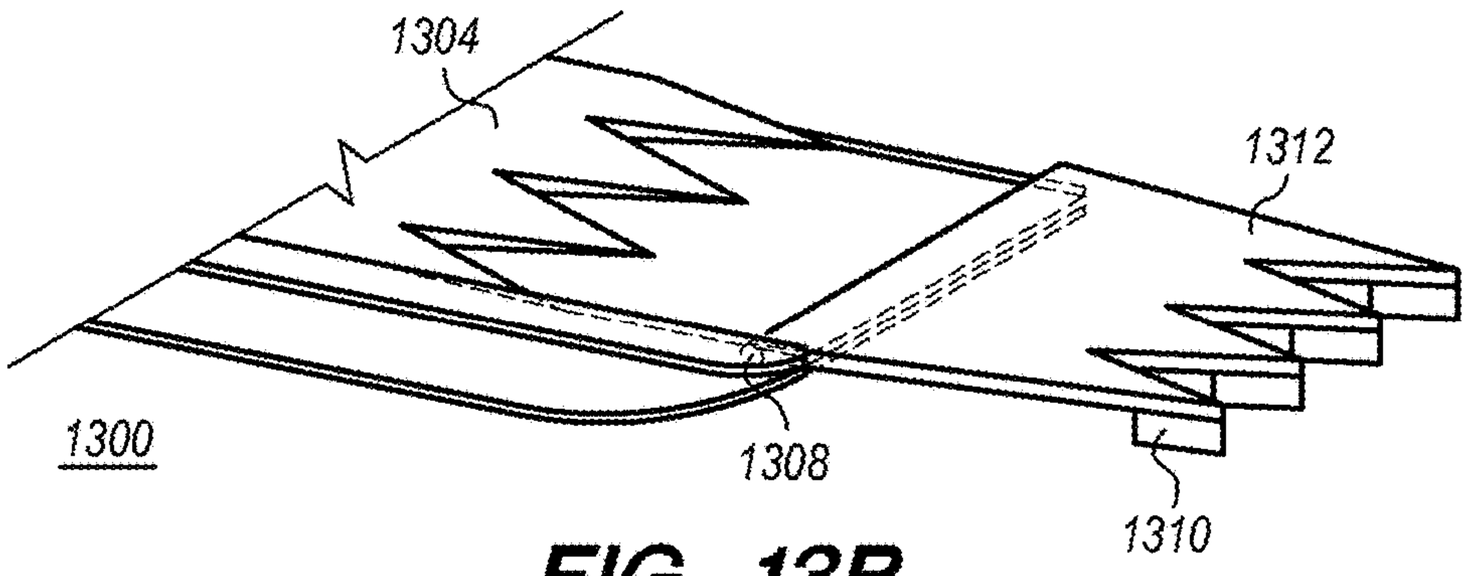

FIG. 13B

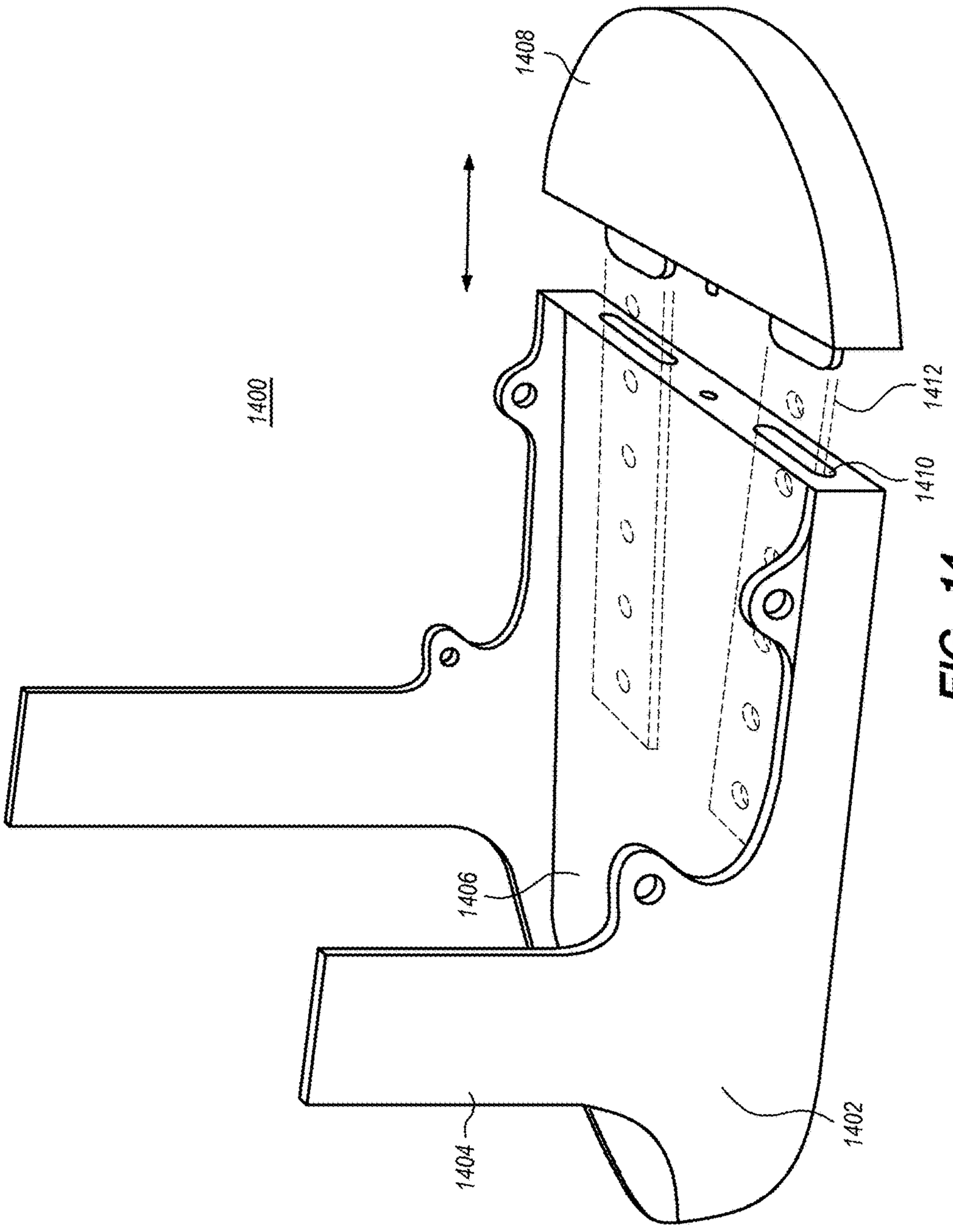

FIG. 14

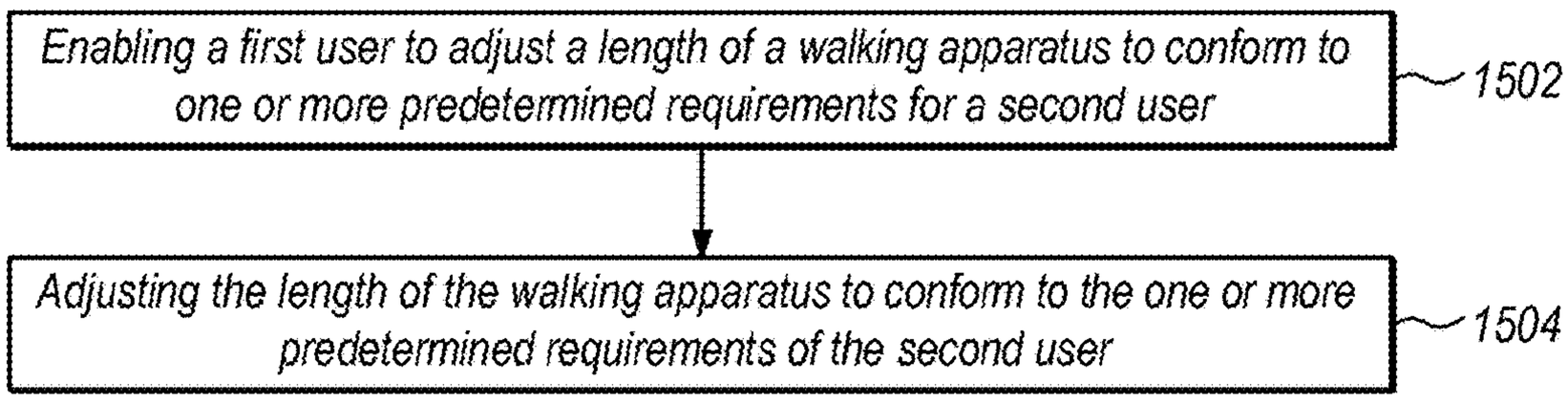
Enabling a first user to adjust a length of a walking apparatus to conform to one or more predetermined requirements for a second user
1502
Adjusting the length of the walking apparatus to conform to the one or more predetermined requirements of the second user
1504

FIG. 15

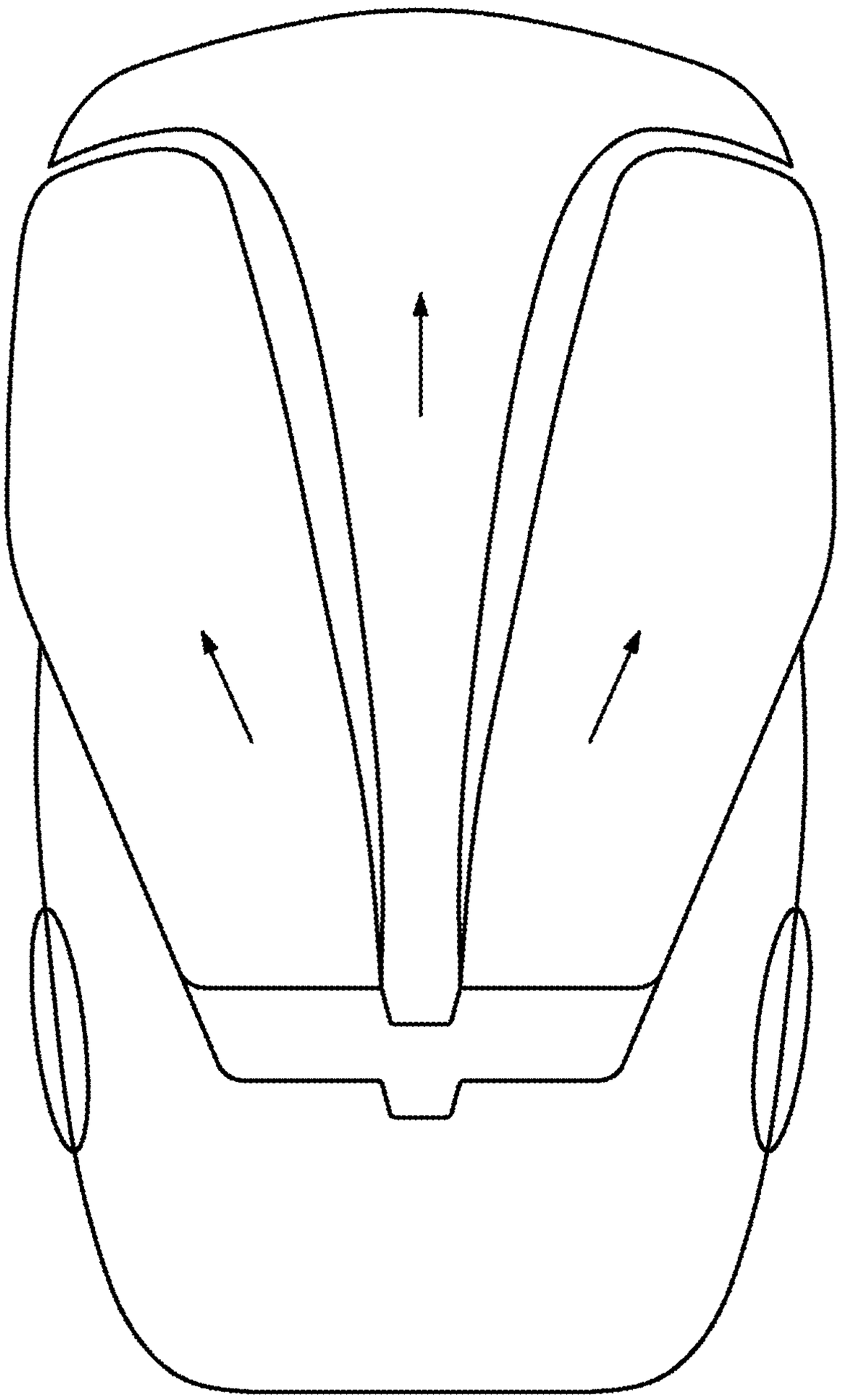

FIG. 16A

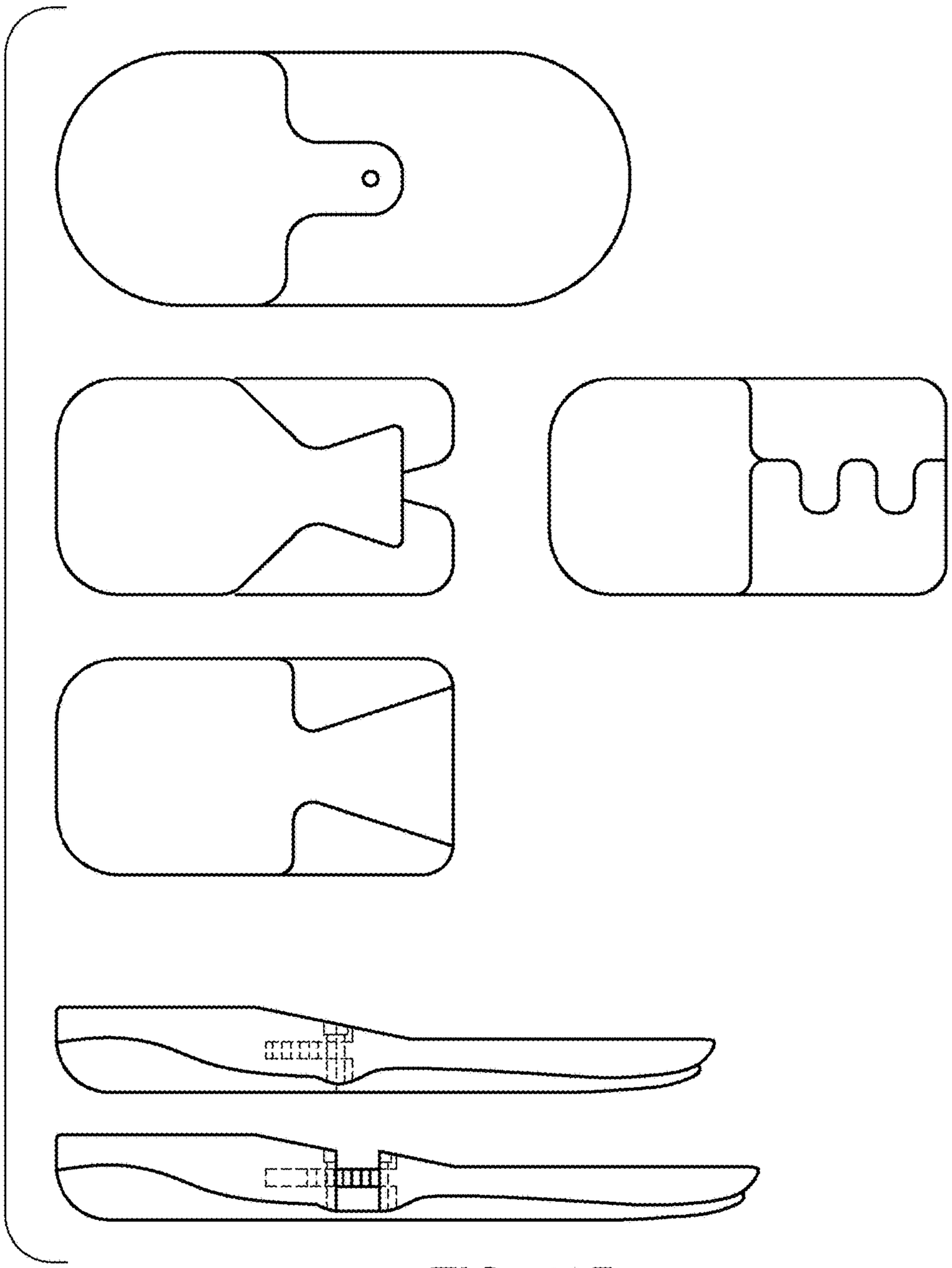

FIG. 16B

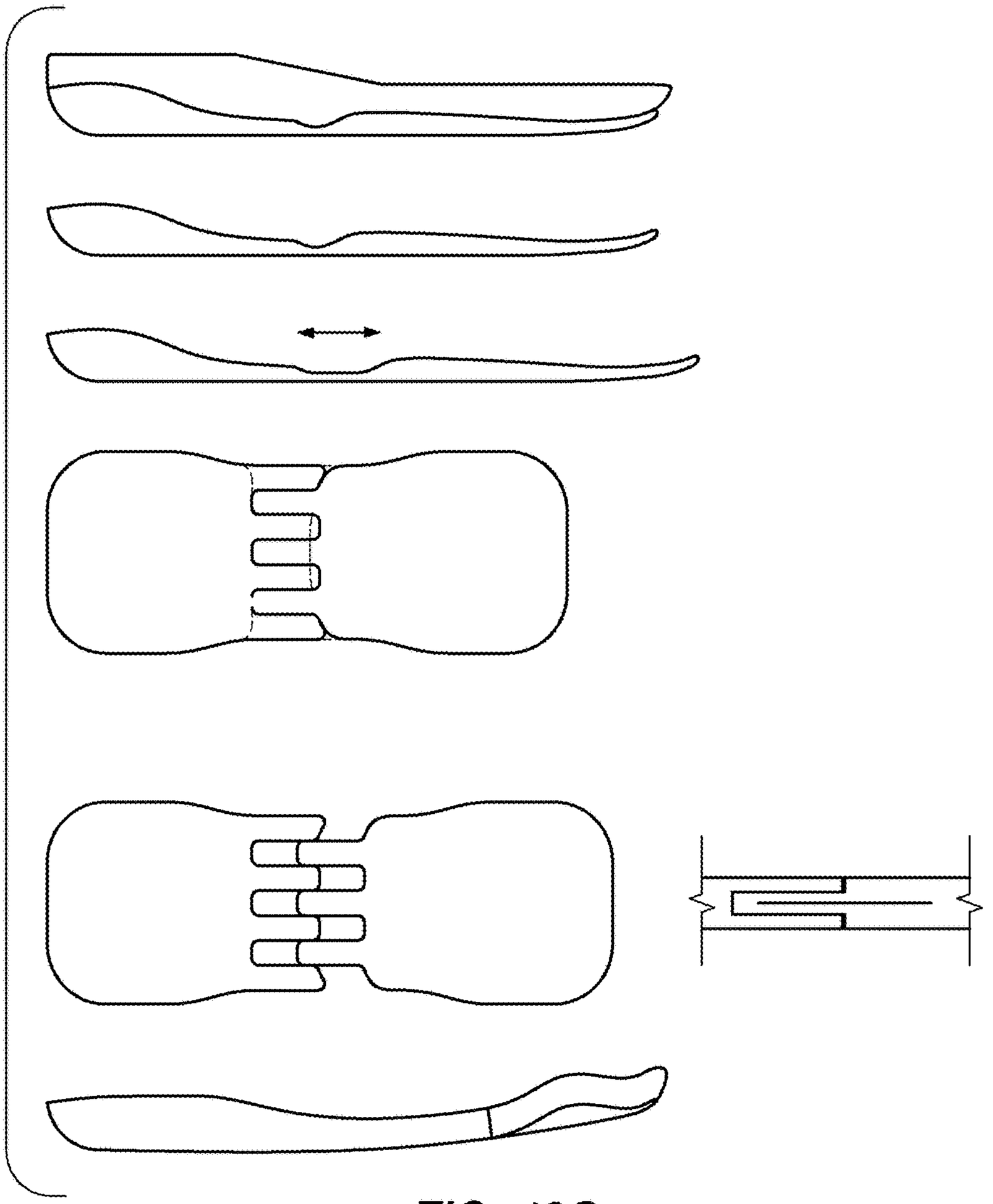

FIG. 16C

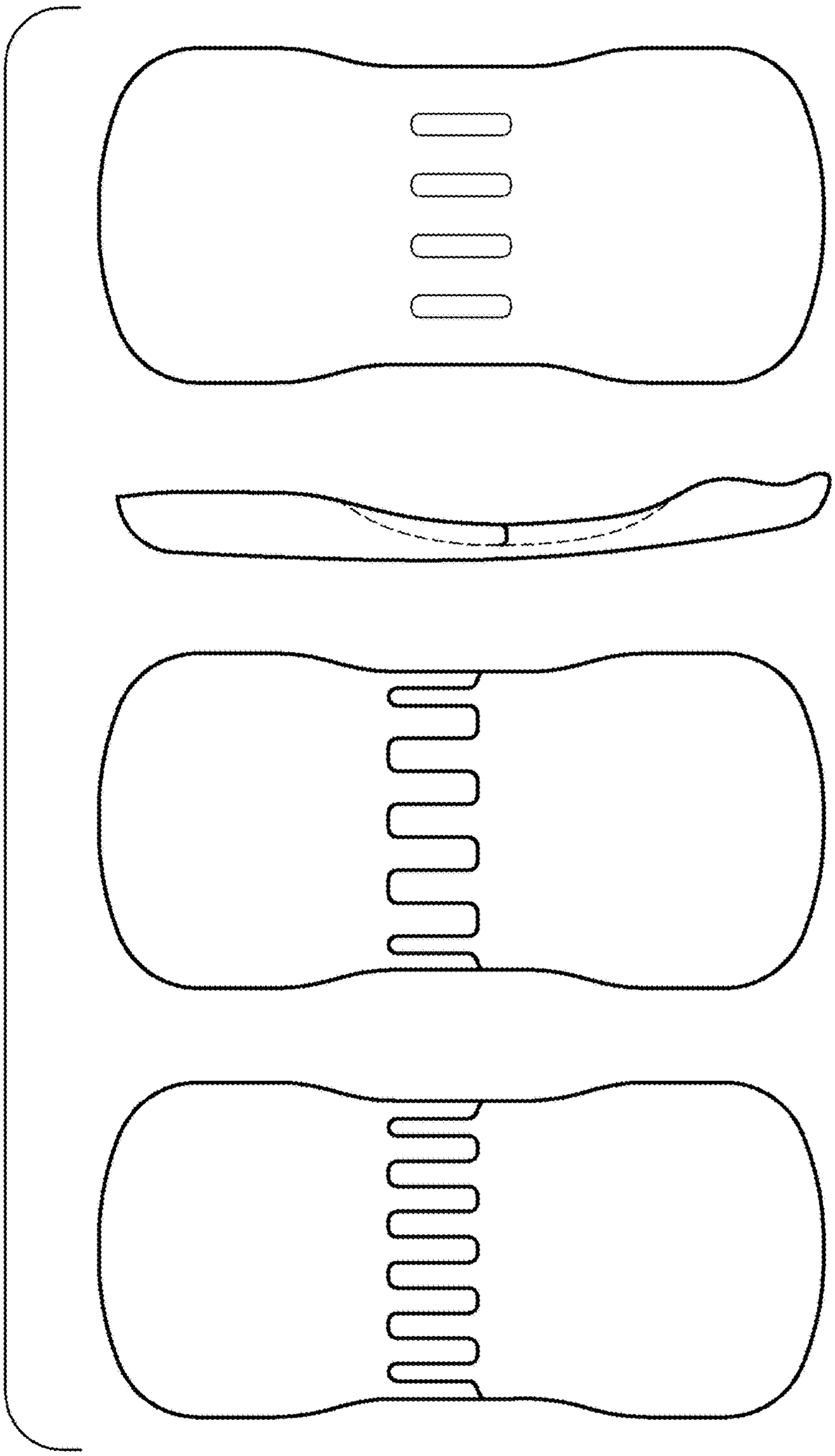

FIG. 16D

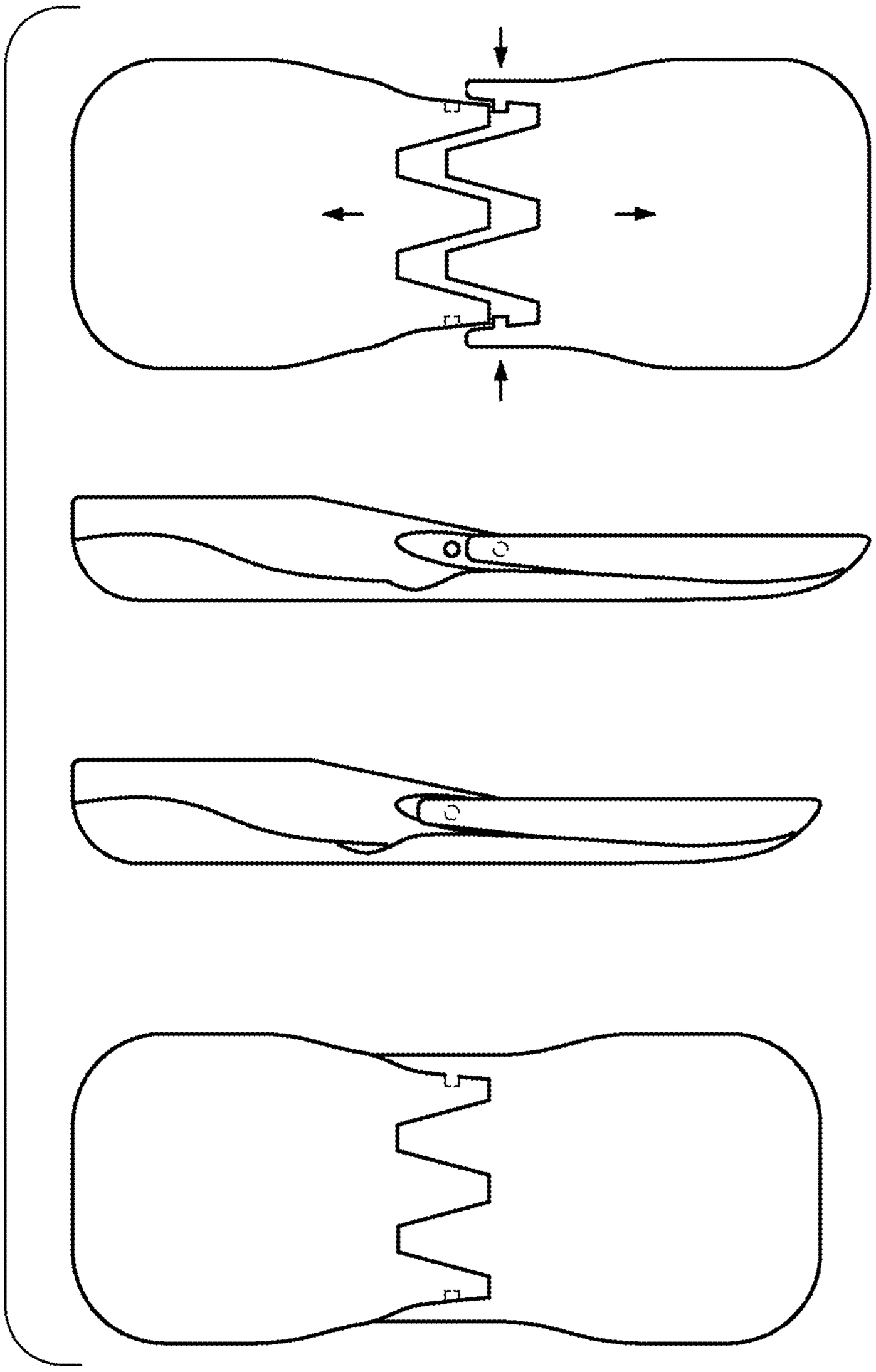

FIG. 16E

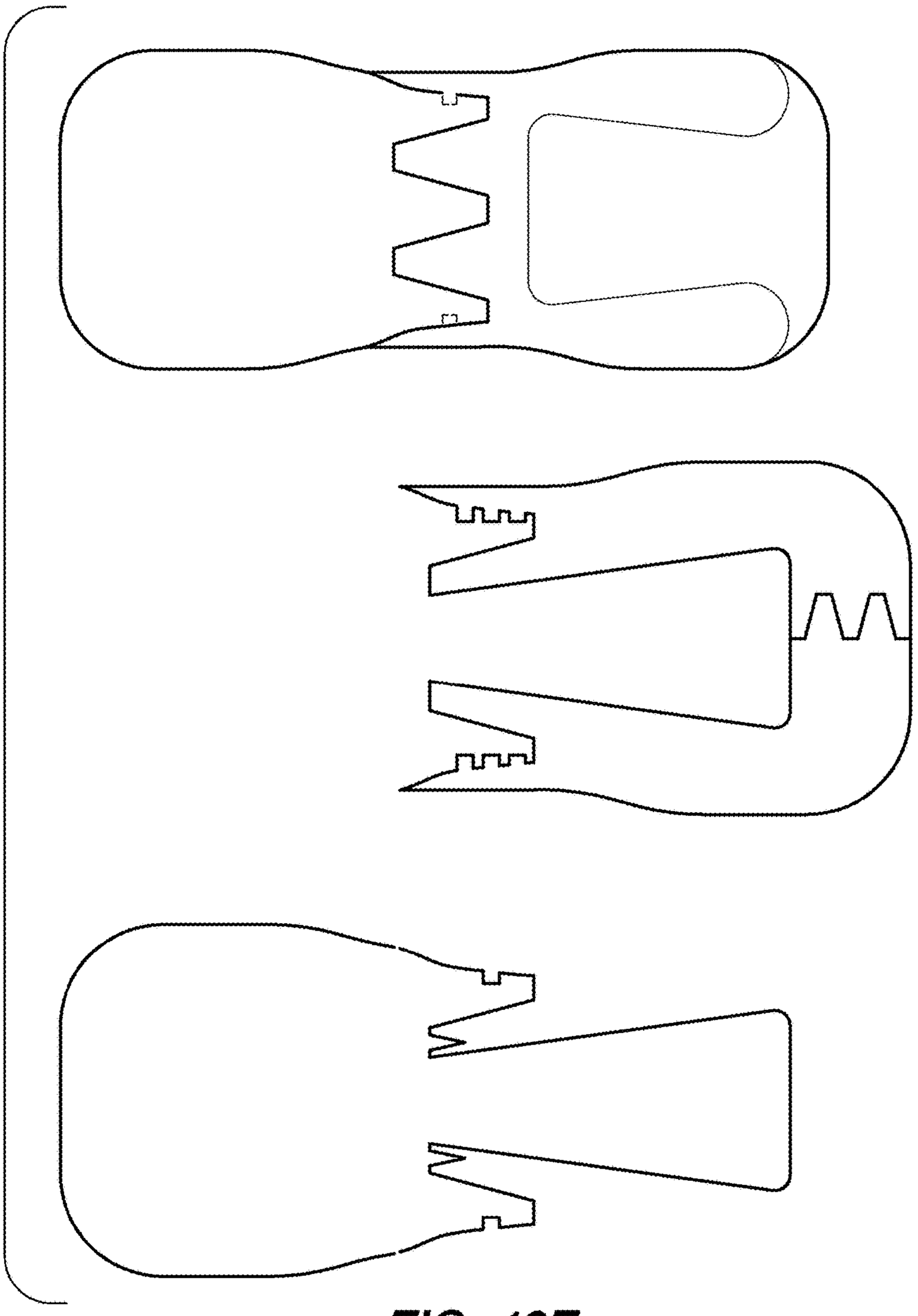

FIG. 16F

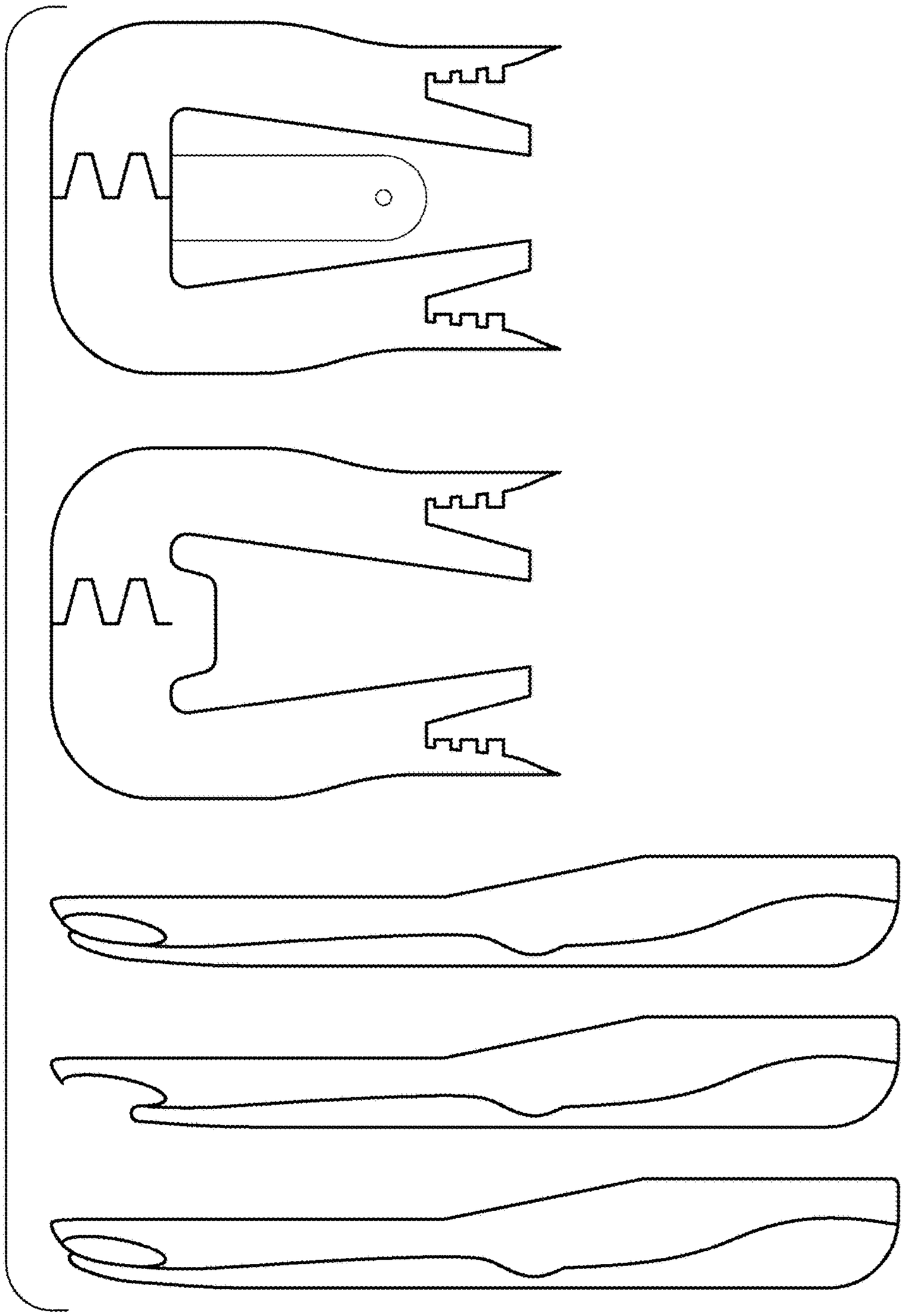

FIG. 16G

ADJUSTABLE WALKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application U.S. Ser. No. 15/336,650, filed on Oct. 27, 2016 is a continuation based on U.S. Ser. No. 14/789,918, now U.S. Pat. No. 9,510,965, issued on Dec. 6, 2016, which claims priority from U.S. Ser. No. 62/019,839, filed on Jul. 1, 2014 are incorporated by reference in their entirety.

BACKGROUND

Field

The present disclosure relates generally to orthopedic walking boots.

Background

It is common that people, especially active and/or frail people, experience a variety of lower leg and ankle injuries. To aid in the treatment of the injuries it is desirable to immobilize the injury, typically above and below the affected joint.

Physicians traditionally place a patient's leg in a short leg cast, which is a cast that usually begins at the patient's toes and ends below the patient's knee. Generally, casts retain heat, cause an itching sensation on the skin, and rub against the leg particularly after swelling of the leg subsides.

An alternative to the short leg cast is an orthopedic walking boot, or a premanufactured orthopedic walking boot, that is made of a rigid plastic frame lined with a soft component (e.g, a soft padding or a soft good) to accommodate the leg comfortably. Often, the liner, or soft component, may house a series of air bladders that can be adjusted by the patient to improve the fit and help compress the swelling to reduce pain and increase stability. The orthopedic walking boots can be removed to treat skin problems, such as, to remove sutures or conduct passive range of motion exercises. Short leg casts do not offer the luxury of easy on/off, and the cost associated with applying another cast after removal.

An orthopedic walking boot is primarily a rigid encasing that usually envelopes the leg and immobilizes the foot and ankle at a neutral position (e.g., the foot extends 90 degrees relative to the leg). The patient can walk easiest if the ankle is fixed at 90 degrees. At angles other than 90 degrees the patient will be walking on the toes or on the heel thereby altering the gait pattern of the patient. The outer sole of the foot is generally curved from front to back in a rocker bottom fashion. The curvature of the outer sole provides a smoother stride from front to back allowing the heel to strike the ground first, followed by a rocking of foot forward, and finally a push off on the toes for a successful step.

SUMMARY

In accordance with certain aspects of the present disclosure a walking apparatus is provided that includes a sole configured with an adjustable length, a heel portion, a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position relative to the heel portion, wherein a length of the sole is configured to adjust from a first length to a second length when the forefoot portion is adjusted from the first position to the at least one other position.

Another aspect of the present disclosure provides a walking apparatus kit that includes a base, a heel portion including a first tread portion, a plurality of forefoot portions each configured with a different length and a second tread portion, each of the plurality of forefoot portions configured for individual coupling to the heel portion, wherein when one of the plurality of forefoot portions is coupled to the heel portion, the first tread portion and the second tread portion form a sole.

In accordance with certain aspects of the present disclosure, a method of adjusting a length of a walking apparatus is provided that includes activating an actuation mechanism located on a walking apparatus, and adjusting a length of the walking apparatus to conform to one or more predetermined parameters related to a user upon activation of the actuation mechanism.

In accordance with certain aspects of the present disclosure, a walking apparatus in provided that includes a sole having an adjustable length, the sole comprising a heel portion, a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position, wherein a width of the sole is configured to adjust from a first width to a second width when the forefoot portion is adjusted from the first position to the at least one other position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A-**1**D illustrate a side perspective view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **2**A-**2**F illustrate a side perspective view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **3**A-**3**B illustrate a side perspective view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **4**A-**4**D illustrate a side perspective view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **5**A-**5**B illustrate a bottom perspective view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **6**A-**6**B illustrate a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **7**A-**7**E illustrate a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **8**A-**8**B illustrate an actuation mechanism of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **9**A-**9**B illustrate an actuation mechanism of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **10**A-**10**B illustrate a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **11**A-**11**B illustrate a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIG. **12** illustrates a top view of a base portion of a walking apparatus in accordance with certain aspects of the present disclosure;

FIGS. **13**A-**13**B illustrate a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIG. **14** illustrates a side view of a walking apparatus in accordance with certain aspects of the present disclosure;

FIG. **15** illustrates a method of adjusting a characteristic of a walking apparatus in accordance with certain aspects of the present disclosure; and

FIGS. **16**A-**16**G illustrate various views of a walking apparatus in accordance with certain aspects of the present disclosure.

DETAILED DESCRIPTION

Various aspects of the present disclosure will be described herein with reference to drawings that are schematic illustrations of idealized configurations of the present disclosure. As such, variations from the shapes of the illustrations as a result, for example, manufacturing techniques and/or tolerances, are to be expected. Thus, the various aspects of the present invention presented throughout this description should not be construed as limited to the particular shapes of elements (e.g., regions, layers, sections, substrates, etc.) illustrated and described herein but are to include deviations in shapes that result, for example, from manufacturing. Thus, the elements illustrated in the drawings are schematic in nature and their shapes are not intended to illustrate the precise shape of an element and are not intended to limit the scope of the present invention, unless intentionally described as such.

It will be understood that when an element such as a region, layer, section, or the like, is referred to as being "on" another element, it can be directly on the other element or intervening elements may also be present. In contrast, when an element is referred to as being "directly on" another element, there are no intervening elements present. It will be further understood that when an element such as a structure is referred to as being coupled to another element, it can be directly connected to the other element or intervening elements may also be present. Similarly, two elements may be mechanically coupled by being either directly physically connected, or intervening connecting elements may be present. It will be further understood that when an element is referred to as being "formed" on another element, it can be deposited, attached, connected, coupled, or otherwise prepared or fabricated on the other element or an intervening element.

Furthermore, relative terms, such as "lower" or "bottom" and "upper" or "top," may be used herein to describe one element's relationship to another element as illustrated in the drawings. It will be understood that relative terms are intended to encompass different orientations of an apparatus in addition to the orientation depicted in the drawings. By way of example, if the orientation of an orthopedic walking boot shown in the drawings is turned over, elements described as being on the "lower" side of other elements would then be oriented on the "upper" side of the other elements. The term "lower", can therefore, encompass both an orientation of "lower" and "upper," depending of the particular orientation of the orthopedic walking boot. Similarly, if the orientation of an orthopedic walking boot shown in the drawing is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The terms "below" or "beneath" can, therefore, encompass both an orientation of above and below.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and this disclosure.

It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The term "and/or" includes any and all combinations of one or more of the associated listed items.

The detailed description set forth below in connection with the appended drawings is intended as a description of various aspects of the present disclosure and is not intended to represent all aspects in which the present invention may be practiced. The detailed description includes specific details for the purpose of providing a thorough understanding of the present invention. However, it will be apparent to those skilled in the art that the present invention may be practiced without these specific details. In some instances, well-known structures and components are shown in block diagram form in order to avoid obscuring the concepts of the present disclosure.

Various aspects of the present disclosure may provide a walking apparatus with an adjustable length and/or width that may be fitted around the leg to provide support and allow ambulation for an affected limb.

People often experience injuries to the lower leg and ankle. For example, blunt trauma, sports injuries and common falls are the primary causes. Injuries such as fractures of the bones or soft tissue injuries (e.g., ligamentous tears) have similar symptoms. Swelling, pain and inability to ambulate without support are expected and predictable. Some injuries need to be immobilized for a period of time for the injury to heal. The time required for ligamentous injuries to heal is similar to the time required for fractures to heal. A period of 4 to 6 weeks of immobilization is common. Different injuries require different rehab times and regimes.

Aspects of the present disclosure are directed to a walking apparatus (e.g., an orthopedic walking boot) with an adjustable length and/or width to accommodate a variety of foot sizes and swelling. In an aspect of the prevention disclosure, an orthopedic walking boot may include bilateral struts which connect a base of the orthopedic walking boot to an upper portion of the orthopedic walking boot. The struts may be rigid and provided on either side of the leg. The bilateral struts may be held onto the limb with strapping systems that encircle at least a portion of the limb. In another aspect, the base may be attached to a posterior piece which extends from the foot to the back of the leg and calf forming a clamshell configuration. In the clamshell configuration, a single piece encompasses a portion of the side of the leg (similar to the bilateral configuration) as well as the rear of the leg. The orthopedic walking boot may include an adjoining anterior piece that joins or overlaps the posterior piece and is held on by a traditional strapping system or with one or more mechanical attachment mechanisms. In another aspect, the orthopedic walking boot may comprise a "hybrid" configuration (also referred herein as a "multi-sectioned" configuration). In the hybrid configuration, the base may be attached to the bilateral struts of the bilateral configuration and also attached a separate/non-integral posterior element that encompasses the rear of leg (similar to the rear portion of the clamshell). In this manner, the bilateral struts surround the side of the legs while the separate posterior portion encompasses the rear of the leg. Thus, the

hybrid configuration achieves a similar result as the clamshell with multiple sections, hence, "multi-sectioned."

According to one aspect of the present disclosure, the orthopedic walking boot may be configured such that the portion that receives the user's foot (e.g., the base portion) extends at a 90° angle or at substantially 90° relative to a longitudinal axis of the portion that receives the user's leg (e.g., the upper portion). In another aspect, the orthopedic walking boot may include two struts rising from the base. The orthopedic walking boot may further include a soft component within the constraints of the struts and on top of the base. The soft component may be held by straps.

The orthopedic walking boot may include a base portion that is adjustable in length and/or width, in accordance with one aspect of the present disclosure. Traditionally, a hospital, clinic, or orthopedic supply company have had to stock orthopedic walking apparatuses such as walking boots and post-operative shoes in variety of sizes to accommodate users with different foot sizes. Certain foot sizes are more common than others, and a hospital, clinic, or orthopedic supply company may run out of those sizes more quickly causing the stock room to contain a surplus of certain sizes and a dearth of others.

Furthermore, there is a growing awareness that manufacturing fewer versions of a product can increase revenue for the manufacturer. For example, manufacturing a walking apparatus all of one type that can accommodate all foot sizes can reduce the number of parts and/or equipment required during the manufacturing process, and also reduce the amount of material needed to produce the walking apparatus.

In an effort to reduce the number of sizes that a supplier is required to carry and the manufacturer is required to produce, certain aspects of the present disclosure include a walking apparatus that is configured with an adjustable length and/or width. An adjustable walking apparatus can ensure that as long as the product is in stock, the majority of patients will be able to be fitted with the walking apparatus regardless of foot length, width, or amount of swelling since each apparatus can be specifically fitted to an individual patient. Consequently, the adjustable walking apparatus is able to provide a better fit and support.

As discussed above, an aspect of the present disclosure includes an orthopedic walking boot with an outer sole that is adjustable in length. FIGS. **1A-1D** each illustrate an adjustable orthopedic walking boot **100** with an outer sole which may be made up of multiple sections **110**, **112** and overmolded to the base **102** of the orthopedic walking boot **100**. Each section of the outer sole **110**, **112** may be formed of an elastomeric material, and the elastomeric material of the first section **110** may be the same or different than the elastomeric material of the section **112**. The orthopedic walking boot **100** may include a support assembly made up of bilateral struts **104**. However, the adjustable orthopedic walking boot may alternatively have support assemblies consistent with the clamshell or hybrid types discussed above.

FIGS. **1A-1D** each illustrate one aspect of the present disclosure in which an adjustable orthopedic walking boot **100** with a bilateral struts **104** support system includes a base **102** made up of a heel portion **106** and an adjustable forefoot portion **108**. FIG. **1A** shows the adjustable orthopedic walking boot **100** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **102** and be made up of a first section **110** and a second section **112**. In particular the first section **110** of the outer sole can cover the heel portion **106** of the base **102**, while the second section **112** of the outer sole can cover the forefoot portion **108** of the base **102**. As seen in the illustration, the second section **112** of the outer sole can remain behind the first section **110** of the outer sole when the forefoot portion **108** is in a non-extended position with respect to the heel portion **106**. Moreover, the outer sole may extend up the sides of the perimeter of the walker base **102** to maximize surface contact between the outer sole and the base **102**. In an aspect, the outer sole may comprise a thermoplastic elastomer bonded by overmolding to the base **102**. The base **102** may comprise a rigid polypropylene material. Alternatively, a number of different material pairs may be bonded in a similar manner, as long as they are chemically and thermally compatible. The bottom surface of both of the first section **110** and the second section **112** of the outer sole may include tread formed during the overmolding process. Various tread patterns may be applied by using a series of inserts in the overmold tool, where each insert is designed aesthetically or otherwise, to provide a different appearance of the tread while maintaining the desired physical properties, e.g., water channeling, grip on slippery surfaces, etc. Furthermore, the longitudinal axis of the outer sole may be defined as the axis along the direction from the heel of the outer sole to the toe/forefoot of the outer sole.

FIG. **1B** shows a similar adjustable orthopedic walking boot **100** as illustrated in FIG. **1A**, but with the adjustable orthopedic walking boot **100** further including a soft component **122** positioned within the constraints of the struts **104** and on top of the base **102** of the walking boot. The soft component **120** may be held in position by a plurality of straps **122** that operatively couple to the base **102** with coupling members **124**. Alternatively, the straps **122** can operatively couple to the base **102** and the struts **104** using a hook-and-eye type fastener, an adhesive, or a tying member. Furthermore, the soft component can include a gap **126** proximal to the forward most position of the forefoot portion **108** that allows for air-flow to the user's toes and/or feet while in the soft component **120**. Alternately, the soft component **120** can include be configured so that there is no gap **126**, but instead has a closed end surface that can provides additional protection to a user's toes.

FIG. **1C** illustrates the adjustable walking boot of FIG. **1A** but in the extended position. More specifically, the forefoot portion **108** is illustrated as being adjusted from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **106**. When the forefoot portion **108** is adjusted or moved from the first position to the second position, a section **114** of the second portion **112** of the outer sole moves from behind the first portion **110** of the outer sole thereby effectively extending the length of the outer sole from a first length (e.g., non-extended position) to a second length (e.g., extended position). The adjustment is illustrated by arrow **116** and can create a separation gap **118** between the forefoot potion **108** and the heel portion **106** on an inner surface of the walking boot **100**. Although not illustrated, the exposed section **114** may include a lip or terraced portion that is configured to mate with a forward most edge of the first portion **110** of the outer sole to provide a smooth transition between the exposed section **114** of the second portion **112** of the outer sole and the first portion **110** of the outer sole. Such a configuration can provide an even walking surface for the user, thereby increasing the stability of the walking boot **100**. Conversely, when the forefoot potion **108** is adjusted from the extended position back to the non-extended position, the exposed section **114** of the second portion **112** of the

outer sole retracts behind the first portion **110** of the outer sole thereby effectively shortening the length of the outer sole.

FIG. **1**D shows the same adjustable walking boot with the soft component **122** as depicted in FIG. **1**B but with the forefoot portion **108** in the extended position as illustrated in FIG. **1**C.

FIGS. **2**A-**2**D each illustrate one aspect of the present disclosure in which an adjustable orthopedic walking boot **200** includes a clamshell support **204** and a base **202** made up of a heel portion **206** and an adjustable forefoot portion **208**. FIG. **2**A depicts the adjustable orthopedic walking boot **200** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **202** and be made up of a first section **210** and a second section **212**. In particular the first section **210** of the outer sole can cover the heel portion **206** of the base, while the second section **212** of the outer sole can cover the forefoot portion **208** of the base **202**. As seen in the illustration, the second section **212** of the outer sole can remain behind the first section **210** of the outer sole when the forefoot portion **208** is in a non-extended position with respect to the heel portion **206**. Moreover, the outer sole may extend up the sides of the perimeter of the walker base **202** to maximize surface contact between the outer sole and the base **202**. In an aspect, the outer sole may comprise a thermoplastic elastomer bonded by overmolding to the base **202**. The base **202** may comprise a rigid polypropylene material. Alternatively, a number of different material pairs may be bonded in a similar manner, as long as they are chemically and thermally compatible. The bottom surface of both of the first section **210** and the second section **212** of the outer sole may include tread formed during the overmolding process. Various tread patterns may be applied by using a series of inserts in the overmold tool, where each insert is designed aesthetically or otherwise, to provide a different appearance of the tread while maintaining the desired physical properties, e.g., water channeling, grip on slippery surfaces, etc. Furthermore, the longitudinal axis of the outer sole may be defined as the axis along the direction from the heel of the outer sole to the toe/forefoot of the outer sole.

FIG. **2**B shows a similar adjustable orthopedic walking boot **200** as illustrated in FIG. **2**A, but with the adjustable orthopedic walking boot **200** further including a soft component **220** positioned within the constraints of the clamshell support **204** and on top of the base **102** of the walking boot. FIG. **2**B further illustrates anterior plates **222***a*, **222***b*, **222***c* that are positioned over the soft component **220** and can be used to provide additional protection/support to the anterior portion of a user's foot and/or leg when in the walking boot **200**. Although three anterior plates are depicted in FIGS. **2**B and **2**C, it is understood that more or fewer anterior pieces can be used without departing from the scope of the present disclosure. The soft component **220** and anterior plates **222***a*, **222***b*, **222***c* can be configured such that a gap **226** can be formed proximal to the forward-most position of the forefoot portion **208** which can allow for air-flow to the user's toes and/or feet while in the soft component **220** and covered with the anterior plates **222***a*, **222***b*, **222***c*.

The soft component **220** and anterior plates **222***a*, **222***b*, **222***c* may be held in position by a plurality of straps **228**, as illustrated in FIG. **2**C, that operatively couple to the base **202** with coupling members **230**. The straps **228** can operatively couple to the base **202** and the clamshell support **204** using a hook-and-eye type fastener, an adhesive, a tying member, or any other type of coupling mechanism as understood by one of ordinary skill in the art.

FIG. **2**D illustrates the adjustable walking boot of FIG. **2**A but depicted in the extended position. More specifically, the forefoot portion **208** is illustrated as being adjusted from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **206**. When the forefoot portion **208** is adjusted or moved from the first position to the second position, a section **214** of the second portion **212** of the outer sole moves from behind the first portion **210** of the outer sole thereby effectively extending the length of the outer sole from a first length (e.g., non-extended position) to a second length (e.g., extended position). The adjustment is illustrated by arrow **216** and can create a separation gap **218** between the forefoot potion **208** and the heel portion **206** on an inner surface of the walking boot **200**. Although not illustrated, the exposed section **214** may include a lip or terraced portion that is configured to mate with a forward most edge of the first portion **210** of the outer sole to provide a smooth transition between the exposed section **214** of the second portion **212** of the outer sole and the first portion **210** of the outer sole. Such a configuration can provide an even walking surface for a user, thereby increasing the stability of the walking boot **200**. Conversely, when the forefoot potion **208** is adjusted from the extended position back to the non-extended position, the exposed section **214** of the second portion **212** of the outer sole retracts behind the first portion **210** of the outer sole thereby effectively shortening the length of the outer sole.

FIG. **2**E shows the adjustable walking boot **200** with the soft component **220** and anterior plates **222***a*, **222***b*, **222***c* illustrated in FIG. **2**B but depicted with the forefoot portion **208** in the extended position as illustrated in FIG. **2**D. FIG. **2**F depicts shows the adjustable walking boot **200** with straps **228** and coupling members **230** as depicted in FIG. **2**C but with the forefoot portion **208** in the extended position as seen in FIG. **2**D.

FIGS. **3**A and **3**B illustrate one aspect of the present disclosure in which an adjustable orthopedic walking boot **300** with a bilateral strut **304** support system that can include a base **302** made up of a heel portion **306** and an adjustable forefoot portion **308**. FIG. **3**A shows the adjustable orthopedic walking boot **300** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **302** and be made up of a first section **310** and a second section **312**. In particular the first section **310** of the outer sole can cover the heel portion **306** of the base, while the second section **312** of the outer sole can cover the forefoot portion **308** of the base **302**. As seen in the FIG. **3**A, the entire second section **312** of the outer sole does not remain behind the first section **310** of the outer sole when the forefoot portion **308** is in a non-extended position with respect to the heel portion **306**, as depicted in FIG. **1**A. Instead, in the non-extended position, a break **314** in the outer sole proximal to a midsection of the base **302** can allow the first section **310** and at least a portion of the second section **312** of the outer sole to form the walking surface of the walking boot **300**. Although the break **314** is illustrated as being near a midsection of the base **302**, it is understood that the break **314** can be positioned anywhere along the longitudinal axis of the base **302** without departing from the scope of the present disclosure. Moreover, the outer sole may extend up the sides of the perimeter of the walker base **302** to maximize surface contact between the outer sole and the base **302**. In an aspect, the outer sole may comprise a thermoplastic elastomer bonded by overmolding to the base **302**. The base **302** may comprise a rigid polypropylene material. Alternatively, a number of different material pairs

may be bonded in a similar manner, as long as they are chemically and thermally compatible. The bottom surface of both of the first section **310** and the second section **312** of the outer sole may include tread formed during the overmolding process. Various tread patterns may be applied by using a series of inserts in the overmold tool, where each insert is designed aesthetically or otherwise, to provide a different appearance of the tread while maintaining the desired physical properties, e.g., water channeling, grip on slippery surfaces, etc. Furthermore, the longitudinal axis of the outer sole may be defined as the axis along the direction from the heel of the outer sole to the toe/forefoot of the outer sole.

FIG. **3**B illustrates the adjustable walking boot **300** of FIG. **3**A but depicted in the extended position. More specifically, the forefoot portion **308** is illustrated as being adjusted from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **306**. When the forefoot portion **308** is adjusted or moved from the first position to the second position, a section **316** of the second portion **312** of the outer sole moves from behind the first portion **310** of the outer sole thereby effectively extending the length of the outer sole from a first length (e.g., non-extended position) to a second length (e.g., extended position). The adjustment is illustrated by arrow **318** and can create separation gap **320** between the forefoot potion **308** and the heel portion **306** on an inner surface of the walking boot **300**. Although not illustrated, the exposed section **316** may include a lip or terraced portion that is configured to mate with a forward most edge of the first portion **310** of the outer sole to provide a smooth transition between the exposed section **314** of the second portion **312** of the outer sole and the first portion **310** of the outer sole. Such a configuration can provide an even walking surface for a user, thereby increasing the stability of the walking boot **300**. Conversely, when the forefoot potion **308** is adjusted from the extended position back to the non-extended position, the exposed section **316** of the second portion **312** of the outer sole retracts behind the first portion **310** of the outer sole thereby effectively shortening the length of the outer sole.

FIGS. **4**A-**4**D illustrate one aspect of the present disclosure in which an adjustable orthopedic walking boot **400** includes a clamshell support **404** and a base **402** made up of a heel portion **406** and an adjustable forefoot portion **408**. FIG. **4**A shows the adjustable orthopedic walking boot **400** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **402** and be made up of a first section **410** and a second section **412**. In particular the first section **410** of the outer sole can cover the heel portion **406** of the base **402**, while the second section **412** of the outer sole can cover the forefoot portion **408** of the base **402**. As seen in the FIG. **4**A, the entire second section **412** of the outer sole does not remain behind the first section **410** of the outer sole when the forefoot portion **408** is in a non-extended position with respect to the heel portion **406**, as depicted in FIG. **2**A. Instead, in the non-extended position, a break **414** in the outer sole proximal to a midsection of the base **402** can allow the first section **410** and at least a portion of the second section **412** of the outer sole to form the walking surface of the walking boot **400**. Although the break **414** is illustrated as being near a midsection of the base **402**, it is understood that the break **414** can be positioned anywhere along the longitudinal axis of the base **402** without departing from the scope of the present disclosure. Moreover, the outer sole may extend up the sides of the perimeter of the walker base **402** to maximize surface contact between the outer sole and the base **402**. In an aspect, the outer sole may comprise a thermoplastic elastomer bonded by overmolding to the base **402**. The base **402** may comprise a rigid polypropylene material. Alternatively, a number of different material pairs may be bonded in a similar manner, as long as they are chemically and thermally compatible. The bottom surface of both of the first section **410** and the second section **412** of the outer sole may include tread formed during the overmolding process. Various tread patterns may be applied by using a series of inserts in the overmold tool, where each insert is designed aesthetically or otherwise, to provide a different appearance of the tread while maintaining the desired physical properties, e.g., water channeling, grip on slippery surfaces, etc. Furthermore, the longitudinal axis of the outer sole may be defined as the axis along the direction from the heel of the outer sole to the toe/forefoot of the outer sole.

FIG. **4**B shows a similar adjustable orthopedic walking boot **400** as illustrated in FIG. **4**A, but with the adjustable orthopedic walking boot **400** further including anterior plates **422***a*, **422***b*, **422***c* that can be used to provide additional protection/support to the anterior portion of a user's foot and/or leg when in the walking boot **400**. Although three anterior plates are depicted in FIG. **4**B, it is understood that more or fewer anterior pieces can be used without departing from the scope of the present disclosure. Furthermore, although a soft component is not depicted in FIG. **4**B, it is understood that a soft component with or without a pneumatic pumping system may be worn by a user and positioned between the clamshell support **404** and the anterior plates **422***a*, **422***b*, **422***c* without departing from the scope of the present disclosure. The anterior plates **422***a*, **422***b*, **422***c* can be configured such that a gap **426** can be formed proximal to the forward-most position of the forefoot portion **408** which can allow for air-flow to the user's toes and/or feet while covered with the anterior plates **422***a*, **422***b*, **422***c*. Furthermore, the walking boot **400** can include a pneumatic pumping system that includes one or more bladders (not shown) that can be filled with air or deflated upon actuation of button **424**. When filled, the bladders of the pneumatic pumping system can provide addition support to the user's leg.

A soft component (not shown) and anterior plates **422***a*, **422***b*, **422***c* may be held in position by a plurality of straps (not shown), as illustrated in FIG. **2**C, that can operatively couple to the base **402** with coupling members (not shown). The straps can operatively couple to the base **402** and the clamshell support **404** using a hook-and-eye type fastener, an adhesive, a tying member, or any other type of coupling mechanism as understood by one of ordinary skill in the art.

FIG. **4**C illustrates the adjustable walking boot **400** of FIG. **4**A but in the extended position. More specifically, the forefoot portion **408** is illustrated as being adjusted from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **406**. When the forefoot portion **408** is adjusted or moved from the first position to the second position, a section **416** of the second portion **412** of the outer sole moves from behind the first portion **410** of the outer sole thereby effectively extending the length of the outer sole from a first length (e.g., non-extended position) to a second length (e.g., extended position). The adjustment is illustrated by arrow **418** and can create separation gap **420** between the forefoot potion **308** and the heel portion **306** on an inner surface of the walking boot **400**. Although not illustrated, the exposed section **416** may include a lip or terraced portion that is configured to mate with a forward most edge of the first portion **410** of the outer sole to provide a smooth transition

between the exposed section **414** of the second portion **412** of the outer sole and the first portion **410** of the outer sole. Such a configuration can provide an even walking surface for a user, thereby increasing the stability of the walking boot **400**. Conversely, when the forefoot potion **408** is adjusted from the extended position back to the non-extended position, the exposed section **416** of the second portion **412** of the outer sole retracts behind the first portion **410** of the outer sole thereby effectively shortening the length of the outer sole.

FIG. **4**D illustrates the adjustable walking boot **400** with the anterior plates **422***a*, **422***b*, **422***c* depicted in FIG. **4**B but with the forefoot portion **408** in the extended position as illustrated in FIG. **4**C.

FIG. **5**A illustrates a bottom surface view of an adjustable walking boot **500** (such as those depicted in FIGS. **3**A-**3**B and **4**A-**4**B where the portion of the tread/sole formed on the forefoot portion **504** form part of the walking surface of the boot when in the non-extended position) as the forefoot portion **504** is adjusted in a direction **520** to extend the length of the outer sole to accommodate a user with a larger foot size than the walking boot **500** provides when in the non-extended position. More specifically, FIG. **5**A depicts one aspect in which the adjustable walking boots of the present disclosure are able to maintain a continuous tread along an entire length of the longitudinal axis of the outer sole when the adjustable walking boot is adjusted from a shorter length **522** to a larger length **524** to accommodate a larger foot size. As seen in FIG. **5**A, the heel portion **502** can be formed with fingers **508** that can act as extensions of the first tread surface **510**, and are configured to traverse a break **514** between the first tread surface **510** and the second tread surface **512**, and completely fill in the channels **506** formed in the second tread surface **512** when the forefoot portion **504** is in the non-extended position. The forefoot portion **508** can also includes extension columns **526** of the second tread surface **512** which are formed in between the channels **506**, as depicted in FIG. **5**A. The extension columns **526** of the second tread surface **512** include extension sections **516** that can be positioned behind or on top of (e.g., overlap) the first tread surface **510** when the walking boot **500** is in the non-extended position. However, when the forefoot portion **504** is adjusted to the extended position, the fingers **508** of the first tread surface **510** can pull away from the channels in the second tread surface **512** forming gaps between the first tread surface **510** and the second tread surface **512**. Meanwhile, the extension sections **516** of the extension columns **526** of the second tread surface **512** are exposed when the forefoot portion **504** is adjusted to the extended position which allows for a continuous tread surface along the entire length of the outer sole at least in the regions of the extension columns **526** which traverse the break **514** between the first tread surface **510** and the second tread surface **512**. Having a continuous treaded surface that traverses the entire length of the outer sole when the walking boot **500** is in an extended position can provide the user with a more stable walking surface reducing the risk of slipping and injury.

According to certain aspects of the present disclosure, the extension columns **526** of the second tread surface **512** do not have to include the extension sections **516** that overlap the first tread surface **510**. In such a scenario, when the forefoot portion **504** is adjusted to the extended position there may be additional gaps between the extension columns **526** and first tread surface **510** at the break **514**. However, there can still be provided a substantially continuous treaded surface along the longitudinal axis of the outer sole, which can provide a stable walking surface for the user. Moreover, a predetermined radius of curvature of the outer sole of the walking boot **500** can be maintained when the forefoot portion **504** is adjusted from the non-extended position to the extended position, further details regarding the radius of curvature are provided below with respect to FIG. **5**B.

FIG. **5**B illustrates a bottom surface view of an adjustable walking boot **500** (such as those depicted in FIGS. **3**A-**3**B and **4**A-**4**B) in which the forefoot portion **504** is adjusted in a direction **520** to extend the length of the outer sole to accommodate a user with a larger foot size. More specifically, FIG. **5**B depicts manners in which the adjustable walking boots of the present disclosure are able to maintain a fixed radius of curvature R_f when the length of adjustable walking boot is adjusted from a shorter length to a larger length.

FIG. **5**B is depicted as including a midfoot portion **528** that is adjustable with respect to the heel portion **502** and/or the forefoot portion **504**. Each of the heel portion **502**, the midfoot portion **528**, and the forefoot portion **504** include respective channels **506***a*, **506***b*, **506***c* and fingers **508***a*, **508***b*, **508***c* which are similarly structured as those detailed above with respect to FIG. **5**A. In addition, the fingers **508***a*, **508***b*, **508***c* can act as extension column including (or not) including extension sections (illustrated in FIG. **5**A) that overlap adjacent tread surface on one or more of the heel portion **502**, the midfoot portion **528**, and/or the forefoot portion **508***c*, and which traverse one or more of the breaks **514***b* located therebetween.

As illustrated in FIG. **5**B, each of the heel portion **502**, the midfoot portion **528**, and the forefoot portion **504** is configured with a respective radius of curvature R_1, R_2, and R_3 that when combined provide the outer sole with an overall radius of curvature R_f. Each of the heel portion **502**, the midfoot portion **528**, and the forefoot portion **504** can be configured such that regardless of being in the non-extended position or one or more extended positions the overall radius of curvature is substantially maintained at R_f. Having a non-zero R_f for the overall outer sole can provide the user with a curved bottom boot that can enable easier mobility for the user.

FIGS. **6**A and **6**B illustrate an adjustable orthopedic and/or post-operative walking shoe **600**, according to one aspect of the present disclosure, that can include a rigid, semi-rigid, or soft back support **604**, a rigid, semi-rigid, or soft dorsal forefoot support **616** (e.g., made of a breathable material and including attachment straps couplable to one another), and/or ankle support strap **618**. FIG. **6**A shows the adjustable walking shoe **600** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **602** and be made up of a first section **610** and a second section **612**. In particular, the first section **610** of the outer sole can cover the heel portion **606** of the base **602**, while the second section **612** of the outer sole can cover the forefoot portion **608** of the base **602**. As seen in the FIG. **6**A, the entire second section **612** of the outer sole does not remain behind the first section **610** of the outer sole when the forefoot portion **608** is in a non-extended position with respect to the heel portion **606**, as depicted in FIG. **1**A. Instead, in the non-extended position, a break **614** in the outer sole proximal to a midsection of the base **602** can allow the first section **610** and at least a portion of the second section **612** of the outer sole to form the walking surface of the walking boot **600**. Although the break **614** is illustrated as being near a midsection of the base **602**, it is understood that the break **614** can be positioned anywhere along the longitudinal axis of the base **602** without departing from the

scope of the present disclosure. Moreover, the outer sole may extend up the sides of the perimeter of the walker base **602** to maximize surface contact between the outer sole and the base **602**, in a similar manner described with respect to FIG. **3**A.

FIG. **6**B illustrates the adjustable walking boot **600** depicted FIG. **6**A but in the extended position. More specifically, the forefoot portion **608** is illustrated as being adjusted from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **606**. When the forefoot portion **608** is adjusted or moved from the first position to the second position, sections **620***a*, **620***b* of the second portion **612** of the outer sole extend from behind the second portion **612** of the outer sole thereby effectively extending the length of the outer sole from a first length (e.g., non-extended position) to a second length (e.g., extended position) providing a smooth interface between the second portion **612** of the outer sole and the extension sections **620***a*, **620***b*. As seen in FIG. **6**B, toe section **620***b* can be coupled to extension section **620***a* with member **622** that is contained within toe section **620***b*. Alternately, toe section **620***b* can be coupled to the extension section **620***b* using an adhesive, a screw, a snap fit configuration, and any other coupling mechanism as understood by one of ordinary skill in the art. Still further, toe section **620***b* and extension section **620***a* can be formed as a unitary structure without departing from the scope of the present disclosure. Although not illustrated, the exposed section **620***a* may include a lip or terraced portion that is configured to mate with a forward most edge of the second portion **612** of the outer sole to provide a smooth transition between the exposed section **620***a* of the second portion **612** of the outer sole and the second portion **612** of the outer sole. Such a configuration can provide an even walking surface for a user, thereby increasing the stability of the walking boot **600**. Conversely, when the forefoot potion **68** is adjusted from the extended position back to the non-extended position, the exposed section **620***a* and the toe portion **620***b* of the second portion **612** of the outer sole retracts at least partially behind the second portion **612** of the outer sole thereby effectively shortening the length of the outer sole.

FIGS. **7**A-**7**E illustrate an adjustable orthopedic and/or post-operative soft walking shoe **700** that can include a rigid, semi-rigid, or soft back support **704** (e.g., made of a breathable material and including attachment straps couplable to one another), a rigid, semi-rigid, or soft dorsal forefoot support **712** (e.g., made of a breathable material and including attachment straps couplable to one another), and/or ankle support strap **714**. FIG. **7**A shows the adjustable walking shoe **700** in a non-extended configuration. The outer sole can completely cover the bottom surface of the base **702** and be made up of a unitary first section **710** when the walking shoe **700** is in the non-extended position. In particular, the unitary first section **710** of the outer sole can cover the heel portion **706** of the base **702** and the forefoot portion **708** of the base **702** when in the non-extended position. In addition, the outer sole may extend up the sides of the perimeter of the walker base **702** to maximize surface contact between the outer sole and the base **702**, in a similar manner described with respect to FIG. **3**A. FIG. **7**B shows a side profile of the soft walking boot **700** illustrated in FIG. **7**A in the non-extended position.

FIG. **7**C illustrates the adjustable walking boot **700** depicted in FIG. **7**A but in the extended position. More specifically, the forefoot portion **708** is illustrated as being extended from a first position (e.g., non-extended position) to a second position (e.g., extended position) with respect to the heel portion **706**. When the forefoot portion **708** is adjusted or moved from the first position to the second position, the forefoot portion **708** extends out of the dorsal forefoot support **712** and past a forward-most edge of the unitary first section **710**. The forefoot portion **708** extending past the forward-most edge of the unitary first section **710** can include a second section (not shown) of the outer sole that provides an extended walking surface when the forefoot portion **708** extends past the unitary first section **710**. FIGS. **7**D-**7**E show a side profile and a top angled view of the soft walking boot **700** illustrated in FIG. **7**C in the extended position.

FIGS. **8**A and **8**B illustrate two different views of a post operative shoe including an actuation mechanism that can be configured to facilitate the adjustment of the forefoot portion from the non-extend position, in accordance with one aspect of the present disclosure. Although the actuation mechanism is depicted as being included in a post-operative shoe **800**, it is understood that the actuation mechanism detailed below with respect to FIGS. **8**A and **8**B can be included in any number of different types of walking apparatus such as those illustrated in all the other figures included in the present disclosure. For example, the types of walking apparatuses that can include the actuation member illustrated in FIG. **8**A can include an open-toe orthopedic walking boot, a closed-toe orthopedic walking boot, an orthopedic walking boot including bilateral struts, an orthopedic walking boot including a clamshell configuration, a soft component of an orthopedic walking boot, a post-operative shoe, a clinical walker, and a hospital walker, just to name a few.

As seen in FIG. **8**A, the actuation mechanism **804** can be operatively coupled to the base **802** of a walking apparatus **800**. The actuation mechanism can include a cantilever member **806** that is made up of a spring loaded end **808** that is at least partially fixed to a portion of the underside of the base **802** and an unfixed end **810** that can be configured to pivot when an actuation force is applied thereto. As further illustrated in FIG. **8**A, a pair of arms **810** can be operatively coupled at a predetermined angle to the cantilever member **806**. When an actuation force of a sufficient amount is applied to the unfixed end **810** of the cantilever member **806**, the pair of arms **812** can clear the height of ridges **814**, which allows the base plate **818** and the cantilever member to move freely along tracks **816**. This movement of the base plate **818** can be configured to enable the adjustment of the forefoot portion of the base from a first position to a second different position thereby extending or shortening the length of the walking apparatus **800**. Once the forefoot portion has been adjusted to a desired position, the actuation force can be removed from the unfixed end **810** of the cantilever member **806**, which can allow the pair of arms **812** to relax back down between ridges **814**. This can disenable movement of the forefoot portion until another actuation force is applied to the cantilever member.

As further illustrated in FIG. **8**A, the base plate **818** can be operatively coupled to dorsal toe portions **820** and configured to enable an adjustment of the dorsal toe portions and the forefoot portion at the same time. By way of example, the tracks **816** can be formed at an angle with respect to one another which can enable a widening or a narrowing of the dorsal toe portions **820** as the forefoot portion is adjusted from the first position to the second position. FIG. **8**B is a top view of the adjustable walking apparatus **800** which illustrates an aperture **824** in the inner sole, which allows access to the unfixed end **810** of the cantilever **806** so that an actuation force can be applied thereto to adjust the length of the walking apparatus **800**.

FIGS. **9**A and **9**B illustrate two different views of a post operative shoe **900** including an actuation mechanism that can be configured to facilitate the adjustment of the forefoot portion from the non-extend position, in accordance with one aspect of the present disclosure. Although the actuation mechanism is depicted as being included in a post-operative shoe **900**, it is understood that the actuation mechanism detailed below with respect to FIGS. **9**A and **9**B can be included in any number of different types of walking apparatus such as those illustrated in all the other figures included in the present disclosure. For example, the types of walking apparatuses that can include the actuation member illustrated in FIG. **9**A can include an open-toe orthopedic walking boot, a closed-toe orthopedic walking boot, an orthopedic walking boot including bilateral struts, an orthopedic walking boot including a clamshell configuration, a soft component of an orthopedic walking boot, a post-operative shoe, a clinical walker, and a hospital walker, just to name a few.

As seen in FIG. **9**A, the actuation mechanism can be operatively coupled to the base **902** of a walking apparatus **900**. The actuation mechanism can include an actuator button **904** operatively coupled to a spring **906** and a boss member **908** operatively coupled to the forefoot portion **920** of the base **902** that is configured to engage with ridges **912** operatively coupled to the heel portion **922** of the base **902**. The ridges **912** are in an opposing configuration with respect to the boss member **908** and engage the boss member **908** such that the forefoot portion **920** is held in a fixed position with respect to the heel portion **922**. However, when a force of a predetermined amount is applied to the actuator button **904**, the preloaded spring **906** decompresses which can cause an upward movement of the spring **904** that forces the boss **908** out of engagement from the ridges **912**, thereby enabling movement of the forefoot portion **920** with respect to the heel portion **922**. The forefoot portion **920** can be operatively coupled to tracks **918** using a male slide member **914** and a female slide member **916**. This movement can result in an extension of the length of the walking apparatus **900**.

FIG. **9**B is a side view of the adjustable walking apparatus **900** which illustrates the actuator button **904** positioned on a side portion of the walking apparatus. As appreciated by one of ordinary skill in the art, the actuator button can be positioned anywhere on the walking apparatus **900** that enables ease of use and comfort for the user. In addition, there may be a single actuator button **904** or a plurality of actuator buttons that can be actuated simultaneously or individually without departing from the scope of the present disclosure.

As illustrated in FIG. **9**B, a dorsal toe portion **924** is depicted as being integrally formed with the forefoot portion **920** and which moves with the forefoot portion **920** when the actuator button **904** is actuated. However, as also understood, the dorsal toe portion **924** can include separate components operatively coupled to the male slide **914** and the female slide **916** such that the dorsal toe portions **924** can also move along with the forefoot portion **920** when they are not integrally formed therewith.

Furthermore, the tracks **918** can be formed at an angle with respect to one another which can enable a widening or a narrowing of the dorsal toe portions as the forefoot portion **920** is adjusted from the first position to the second position.

FIGS. **10**A and **10**B illustrate adjustable walking boots configured for lengthwise and widthwise adjustment. More specifically, FIG. **10**A depicts an adjustable walking boot **1000** including a clamshell support structure **1004** operatively coupled to a base **1002**. The base **1002** can include a heel portion **1006** and a forefoot portion **1008**. An outer sole of the walking boot **1000** can be made up of a first section **1010** which covers the heel portion **1006** of the base **1002**, and a second section **1012** that covers the forefoot portion **1008** of the base **1002**. The walking boot **1000** illustrated in FIG. **10**A can further include dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* that are configured to protect the foot and ankle of a user. A tapered side portion **1018** that is operatively coupled to the heel portion is configured to engage with the dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* and hold them in a fixed position when the forefoot portion **1008** is in a fixed position relative to the heel portion **1006**. The dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* can provide a gap **1020** in the toe portion of the walking boot **1000** to allow air flow into the boot. An actuation mechanism **1014** similar to that illustrated in FIGS. **9**A and **9**B can be included in the base **1002**, which can enable the adjustment of the forefoot portion **1008** and the dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* from a first position to a second position with respect to the heel portion **1006**. The geometry of the tapered side portion **1018** is configured to enable an adjustment in the width of the dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* when the forefoot portion is moved from a first position to a second position by enabling an expansion or compression of the dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d*, as the components move past or retract into contact with the outer contact point of the tapered side portion **1018**.

FIG. **10**B is directed to a similar adjustable walking boot **1000** as depicted in FIG. **10**A, except that the dorsal forefoot components **1016***a*, **1016***b*, **1016***c*, **1016***d* further include toe closure component **1022** that provides additional protection to the toe region of the user's foot.

FIGS. **11**A and **11**B depict an adjustable walking boot **1100** including dorsal forefoot components and a toe closure component similar to those described with respect to FIGS. **10**A and **10**B. However, adjustable walking boot **1100** illustrated in FIGS. **11**A and **11**B is enable a widening or narrowing of the dorsal forefoot components **1116***a*, **1116***b* using a split-toe configuration. The dorsal forefoot components **1116***a*, **1116***b* can be configured to remain in a fixed position when the forefoot portion is fixed relative to the heel portion without requiring the tapered side portion **1018** illustrated in FIGS. **10**A and **10**B.

FIG. **12** illustrates one aspect of the present disclosure in which a forefoot portion **1204** of a base **1200** of a walking apparatus includes a left forefoot portion **1204***a* and a right forefoot portion **1204***b* that include an overlapping region **1208** proximal to the toe of the walking apparatus. A cam **1206** accessible from the inner sole or side portion of the base, for example, is configured to adjust a width of the forefoot portion **1204** when actuated. For example, the cam **1206** can include an aperture **1208** that is configured to receive a tool that enables a rotation of the cam **1206**. The cam **1206** is shaped such that when rotated, the left forefoot portion **1204***a* and the right forefoot portion **1204***b* are adjusted to respective expanded positions **1204***c* and **1204***d*. Conversely, the cam **1206** can be actuated to narrow the width of the toe in a similar manner described above. Moreover, the width of the walking apparatus can be adjusted independently of the length of the walking apparatus according to certain aspects of the present disclosure.

FIGS. **13**A and **13**B illustrate adjustable walking boots **1300** in accordance with certain aspects of the disclosure. More specifically, FIG. **13**A depicts an adjustable walking

boot **1300** that includes multiple extension members **1306** that are each attached to the inner sole **1304** of the walking boot with a hinge member **1308**. When the length of the walking boot needs to be adjusted, the extension portions **1306** can be folded out to provide the required extra length. Although not shown, a locking mechanism can be used to ensure that the extension portions **1306** are locked into place once they are folded out. Furthermore, each of the extension members **1306** can be configured with a tread or pad **1310** to provide a stable surface on which the user can safely use as a walking surface. FIG. **13**B depicts an adjustable walking boot **1300** that includes a single extension member **1312** attached with a hinge **1308** to the inner sole **1304** of the boot. The single extension member **1312** can be locked into position and configured with a single or multiple treads or pads **1310** to provide a stable surface on which the user can use as a walking surface. Although three rectangular extension members **1306** are illustrated in FIG. **13**A and a single fold out member with a tooth-like edge is illustrate in FIG. **13**B, the fold out extension member(s) **1306** can take on any geometry, size, or quantity without departing from the scope of the present disclosure.

FIG. **14** depicts an assembly kit configured to provide an adjustable walking boot **1400** when assembled. The assembly kit includes a base **1402** that can be made up of a support structure **1404** (e.g., bilateral struts or a clamshell configuration) and a heel portion **1406**. The base **1402** includes one or more channels **1410** configured to receive extension portion(s) **1412** of the forefoot component **1408** of the assembly kit. The extension portions **1412** can include any geometry and/or size and are configured to provide stability and support along a longitudinal axis of the assembled walking boot **1400**. The assembly kit can include multiple forefoot components **1408** each of a different length to accommodate a variety of foot sizes.

FIG. **15** illustrates a method of adjusting a length of a walking apparatus according to one aspect of the present disclosure. For example, a first user can be enabled to adjust a one or more characteristics of the walking apparatus such as a length and/or width to conform to a foot size a second user. The first user can include a doctor, a physician's assistant, a nurse, or a home healthcare working, just to name a few. The second user may a patient who does not have access rights to the mechanism that enables widening and/or lengthening of the walking apparatus. The first user can be enabled to adjust the length and/or length of the walking apparatus by being provided with an actuation tool such as a key, a wrench or a screwdriver that provides access to an actuation mechanism inside of the walking apparatus that varies its length and or width. The second user in one aspect of the present disclosure is not access to the actuation tool and thus is not enabled to adjust the length and/or width of the walking apparatus. When the length and or width of the walking apparatus is adjusted, in one aspect of the present disclosure, a predetermined radius of curvature of the outer sole of the walking apparatus can be maintained.

FIGS. **16**A-**16**F illustrate various configurations of an outer sole of an adjustable walking apparatus according to certain aspects of the disclosure. The configurations depicted in FIGS. **16**A-**16**F can be configured for any of the adjustable walking apparatuses described above, and can include an outer sole made up of a plurality of individual sections that are operatively coupled to one another, or a stretchable unitary structure that conforms to plurality of different lengths and widths.

It is understood, that any of the aspects illustrated, depicted, or described in the present disclosure, including in the figures, can be combined and/or used with any other aspect illustrated, depicted, or described in the present disclosure, including the figures. For example, each of the aspects set forth in the figures and/or described in the disclosure can be used in or combined with an open-toe orthopedic walking boot, a closed-toe orthopedic walking boot, an orthopedic walking boot including bilateral struts, an orthopedic walking boot including a clamshell configuration, a soft component of an orthopedic walking boot, a post-operative shoe (e.g., a shoe with a stiff base that can be worn on either the left foot or the right foot that can enable a patient to walk without reinjuring the toe(s) and/or foot), a clinical walker, and a hospital walker, just to name a few. Furthermore, it is understood that the length and/or width of a walking apparatus provided by the present disclosure can be adjusted to a plurality of positions to accommodate a plurality of foot sizes without departing from the spirit of the present disclosure. The scope of the present disclosure further includes that the length and/or the width of a walking apparatus provided by the present disclosure can be adjusted at the forefoot component, the midfoot component, and/or the heel component either independently or in an interconnected manner without departing from the spirit of the present disclosure.

The claims are not intended to be limited to the various aspects of this disclosure, but are to be accorded the full scope consistent with the language of the claims. It is noted that specific illustrative embodiments of the disclosure have been shown in the drawings and described in detail hereinabove. It is to be understood that various changes and modifications may be made without departing from the spirit and scope of the disclosure. All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed under the provisions of 35 U.S.C. § 112, sixth paragraph, unless the element is expressly recited using the phrase "means for" or, in the case of a method claim, the element is recited using the phrase "step for."

What is claimed is:

1. A walking apparatus, comprising: a sole having an adjustable length, the sole comprising: a heel portion; a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position relative to the heel portion; wherein a length of the sole is configured to adjust from a first length to a second length when the forefoot portion is adjusted from the first position to the at least one other position, further comprising: at least one dorsal forefoot section having an adjustable width; and at least one side portion configured to enable an adjustment in the width of the at least one dorsal forefoot section when the forefoot portion is adjusted from the first position to the at least one other position.

2. The apparatus of claim **1**, further comprising an actuator mechanism operatively coupled to at least one of the forefoot portion and the heel portion, the actuator mechanism configured to enable the adjustment of the forefoot portion from the first position to the at least one other position.

3. The apparatus of claim **2**, wherein the actuator mechanism comprises: a cantilever configured for actuation; a

plurality of arms operatively coupled to the cantilever; and a plurality of ridges; wherein the plurality of arms are configured for retention between the plurality of ridges.

4. The apparatus of claim **3**, wherein when the cantilever is actuated, the plurality of arms are configured to clear a height of the plurality of ridges enabling the adjustment of the forefoot portion from the first position to the at least one other position.

5. The apparatus of claim **4**, wherein the cantilever is spring loaded such that when the cantilever is no longer actuated, the plurality of arms are configured to return to the plurality of gaps between the plurality of ridges.

6. The apparatus of claim **4**, wherein the forefoot portion comprises a surface configured to enable actuation of the cantilever.

7. The apparatus of claim **2**, wherein the actuator mechanism comprises: an actuator; a spring operatively coupled to the actuator; an arm operatively coupled to the actuator, the arm including a plurality of ridges with a plurality of gaps therebetween; and a boss configured for retention in the plurality of gaps between the plurality of ridges.

8. The apparatus of claim **7**, wherein when a force is applied to the actuator, the spring is configured to enable the boss to clear a height of the plurality of ridges enabling the adjustment of the forefoot portion from the first position to the at least one other position.

9. The apparatus of claim **8**, wherein when the force is applied to the actuator the forefoot portion automatically adjusts from the first position to the at least one other position.

10. The apparatus of claim **7**, further comprising a plurality of actuator mechanisms, wherein at least one actuator mechanism is positioned on opposing sides of the at least one of the forefoot portion and the heel portion.

11. The apparatus of claim **1**, wherein the forefoot portion comprises an adjustable width.

12. The apparatus of claim **11**, wherein the forefoot portion further includes an actuator configured to enable an adjustment in the width of the walking apparatus.

13. The apparatus of claim **12**, wherein the actuator includes a cam that when rotated is configured widen and narrow the walking apparatus.

14. The apparatus of claim **13**, wherein the cam includes an aperture configured to receive a tool that enables rotation.

15. The apparatus of claim **1**, wherein the at least one side portion is formed with a tapered shape and is configured to remain stationary when the forefoot portion is adjusted from the first position to the at least one other position.

16. The apparatus of claim **15**, wherein the tapered shape of the at least one side portion is configured to enable an expansion or a compression of the at least one dorsal forefoot section, when the forefoot portion is adjusted from the first position to the at least one other position.

17. A walking apparatus, comprising: a sole having an adjustable length, the sole comprising: a treaded surface; a heel portion; and a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position relative to the heel portion; wherein a length of the sole is configured to adjust from a first length to a second length when the forefoot portion is adjusted from the first position to the at least one other position, and wherein when the length of the sole adjusts from the first length to the second length, a length of the treaded surface adjusts to traverse the second length of the sole.

18. A walking apparatus, comprising: a sole having an adjustable length, the sole comprising: a heel portion; and a forefoot portion operatively coupled to the heel portion, the forefoot portion configured for adjustment from a first position to at least one other position relative to the heel portion, wherein the heel portion and the forefoot portion form a radius of curvature of the sole, wherein a length of the sole is configured to adjust from a first length to a second length when the forefoot portion is adjusted from the first position to the at least one other position, and wherein the radius of curvature of the sole is maintained when the length of the sole adjusts from the first length to the second length.

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